MAY 11, 1944

American Machinist

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DETROIT

M3 Submachine Gun Made of Pressed Steel Parts Instead of Forgings

•

Lighting Tomorrow's Metal-Working Shop

•

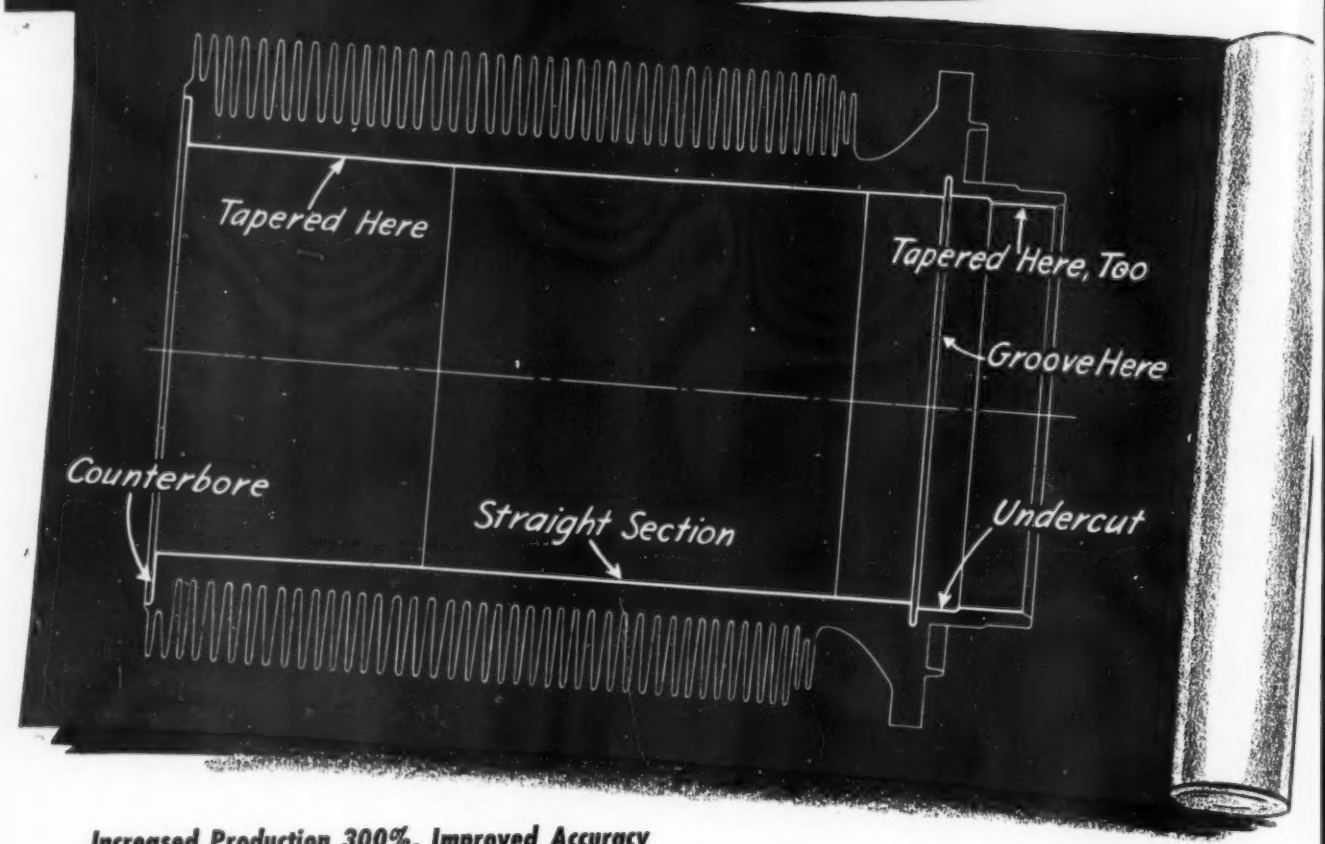
What Taps to Choose for Production Tapping of Precision Threads

•

Brazing Proves Economical for Joining Small and Intricate Parts

✓R v.88³ My-Je 1944

HOW A STUDY IN BLUE SAVED 13,000 MAN-HOURS



Increased Production 300%, Improved Accuracy and Finish, Greatly Reduced Scrap

SOMEWHAT OF A tricky part it was—this aircraft engine cylinder.

It took three machines and a whole series of different set-ups to turn it out—and even then it was not satisfactory. There was considerable scrap, low, low production and of course, costs that couldn't help but be too high.

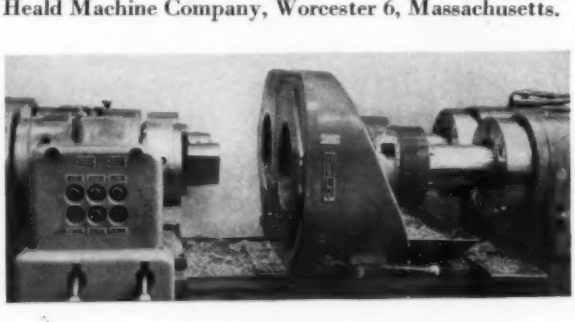
Then the engine builder came to Heald. And "thinking it out paid out"—once again.

Heald Precisioneers suggested doing the job this way... a single set-up... a single machine—the Heald No. 46B Double-end Bore-matic.

This versatile machine generates the tapers at both ends of the cylinder, machines the central straight section in one continuous cut, using specially designed cam-controlled tool slides to turn the trick. Grooves and recesses are then machined by hydraulic cross-feed units.

Result: A new conception of precision—greatly superior alignment, concentricity, squareness, finish and dimensional accuracy. Rejections... practically zero. Production... times three. Man-hours saved... 13,000.

Problems... now or post-war? Let us help you. The Heald Machine Company, Worcester 6, Massachusetts.



HEALD *for more Precision ... Faster!*

Internal and Surface Grinding Machines • Bore-matic Precision Finishing Machines

Tech

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Director of Circulation: Please change my address on American Machinist

From _____

_____

To _____

_____

Signed _____

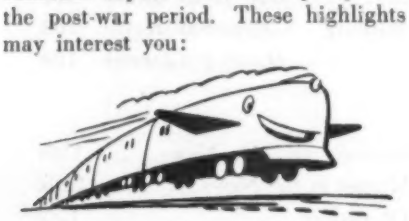
American Machinist Chips

Face Lifting . . . Veteran readers of this journal probably opened their eyes in surprise at the new cover treatment beginning with the previous issue. Confidentially, we believe that the Vice-President in Charge of *American Machinist* Covers got jealous of the new appearance of *Chips* and decided to blossom forth with a fancy format himself. Anyway, we all hope you like the change.

Little Acorns . . . Some 170,000,000 pieces *daily* is the average output of the Fastener Industry, according to the American Institute of Bolt, Nut and Rivet Manufacturers.

Post-War Controls . . . Judging from recent trends in Washington, post-war controls of industrial production seem entirely unlikely. In responsible WPB quarters there never has been any thought that such controls would be necessary or desirable after the war ends. This opinion is widely held in both the Senate and the House. There remain many ardent advocates of government ownership who would go even further after the shooting stops, but their influence is lessening steadily with the general trend toward saner politics

Railroads of Tomorrow . . . Since we are currently engaged in exploring "Metal-Working Tomorrow," we were intrigued by an article in the *Baltimore & Ohio Magazine* giving a forecast of how the railroads expect to live and prosper in the post-war period. These highlights may interest you:



The track of the future will be made of better and tougher steel; fewer joints . . . stronger, safer and will cost less to maintain per ton-mile of traffic. Cars will be made of lighter-weight, high-tensile metals . . . not so much for the purpose of increasing speed as for decreasing dead weight. Use of electric and Diesel locomotives for power will be expanded—but for a long while to come the bulk service will be accomplished by steam engines . . . with many improvements. On the passenger side, the line of development will be a prolongation and enlargement of the air-conditioned, streamlined era which was well under way before the war.

Rough Going . . . Assembly line labor at Consolidated's Ft. Worth plant is hard on portable electric tools. Of approximately 10,000 portable drills in the plant an average of 485 has to be repaired every day. Repairs range from broken cords, plugs, switches and cases to complete burn-outs. Manufacturers and motor repair shops couldn't keep up with the repairs . . . so Consolidated set up its own mass production department.

Industrial Vision . . . Bausch & Lomb has announced one of the most important undertakings by the company in many years—an Industrial Vision Service.

The new program places in the hands of both management and employees, for the first time, a means for properly utilizing visual skills and aptitudes for efficient job performance. And it opens the way for untold thousands of industrial workers to secure adequate eye care and counsel from professional sources. Through a device called the Ortho-Rater a battery of 12 tests can be completed in from 5 to 6 minutes on most subjects.

Wartime conditions permit the placing of this service in only a few war plants where it is most urgently needed. In addition to the many benefits to these favored industries, much valuable information will be added to the pool of data now being prepared for future distribution to industry and the professions.

Gung Ho! . . . If you think *you* have operating difficulties, consider the case of the Chinese Industrial Cooperatives of the Chewan Region. They have held together and even made valuable technical progress despite losses suffered when they had to *bury* their machines *three times* because of Jap invasions.

Industrial Bombing . . . The *Barber-Colman Association News*, through excerpts from the official report of General Arnold, points out that industrial damage even on a very large scale might have absolutely no effect on the front-line strength of a warring nation for 20 years or longer.

For example, steel is certainly an essential to war. Yet only a small proportion of the steel manufactured in any modern industrial nation goes directly into front-line strength. Fully two-thirds goes into plant maintenance and expansion, or civilian consumption channels. Consequently, steel plant destruction, short of two-thirds of the entire industry, pays no immediate dividends.

From another angle, if the sources of 90% of German electric power were destroyed in one week the results might well be decisive. But spread the same destruction over a year's time and the story is different. Given enough time the enemy can recover from anything.

Vest Pocket Heating . . . Stewart-Warner Corp. recently demonstrated a 21 lb. gasoline-burning furnace. Of a type now used in military aircraft, the furnace has enough heating capacity for a 20-room house.

Car Talk . . . Ben Brosheer, *American Machinist* Associate Editor, advises us to discount some of the things we hear about automobiles being pulled down a few years from now into the bantam

class, because of tiny engines and high-octane gas. Cars will be smaller but space will be better utilized. Instead of weighing around 3,000 lbs., they will scale at about 2,000 lbs. Cars at one time were down to 2,000 lbs. and then gradually grew heavier as people demanded more luxury. Lighter weights, according to Ben, will be achieved by changed designs and use of tubular alloy steels.

THIS IS A WAR OF MOTION

Unlike World War I which was characterized by static trench warfare, this is truly a war of ***motion*** in which victories are won by the army which can mass the most men and equipment in the shortest time to strike against critical objectives. In this war of lightning-like maneuvers the army with the superior mechanized equipment naturally has the advantage.

A typically American innovation developed by U. S. Army Ordnance for this type of warfare is the "jeep". Although unimpressive in appearance, this tough little "jeep" has proven its worth by providing Allied forces with superior flexibility of striking power . . . transporting small troop units over the rugged, mountainous terrain in Italy or fording shallow streams in the jungles of New Guinea . . . hauling equipment in the damp cold of Attu, over the hot sands of the Sahara or the muddy beaches of Bougainville. In this manner the versatile "jeep" has been invaluable to all branches of the service, whether Army, Marine Corps, Signal Corps or Red Cross.

HYPOID GEARS PROVIDE THE HIGH-SPEED, DURABLE POWER TRANSMISSION REQUIRED

These extreme conditions are most exacting in the demands they place on the gears used to transmit the driving power from the "jeep's" sturdy engine to its front and rear wheels. Hypoids have successfully met the test by supplying in a small space a smooth flow of power without danger of failure at a wide range of speeds and loads, under split-second starts and abrupt stops.

CUT ON GLEASON MACHINES

These hypoid gears are being cut with great accuracy at high production rates in the plants of leading automotive companies. The pinions are cut on the No. 16 Pinion Machines and the gears on the No. 11 Gear Machines.

Accepted before the war, proven in actual combat, hypoids produced on Gleason machines will transmit smooth, quiet, high-speed power for the automobile of tomorrow.

GLEASON WORKS

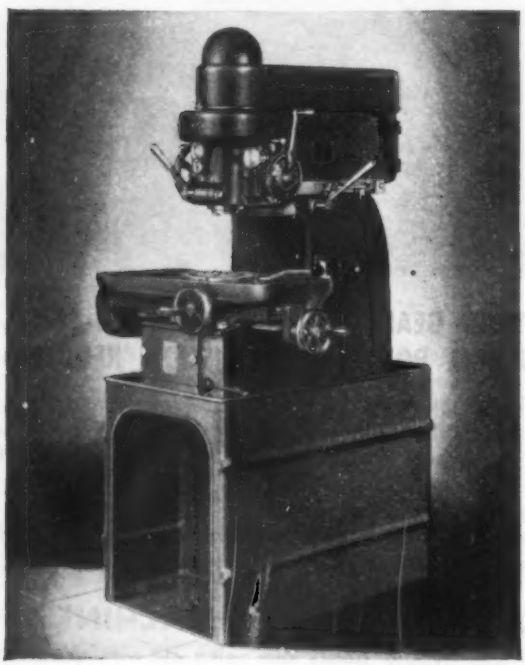
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

ROTARY MILLING
with
a cam controlled detour

CINCINNATI

Below is illustrated a CINCINNATI 0-8 Rotary Table Vertical Milling Machine. For complete specifications write for catalog M-1199. Sweet's Catalog File for Mechanical Industries gives a brief description of all CINCINNATI Milling Machines.

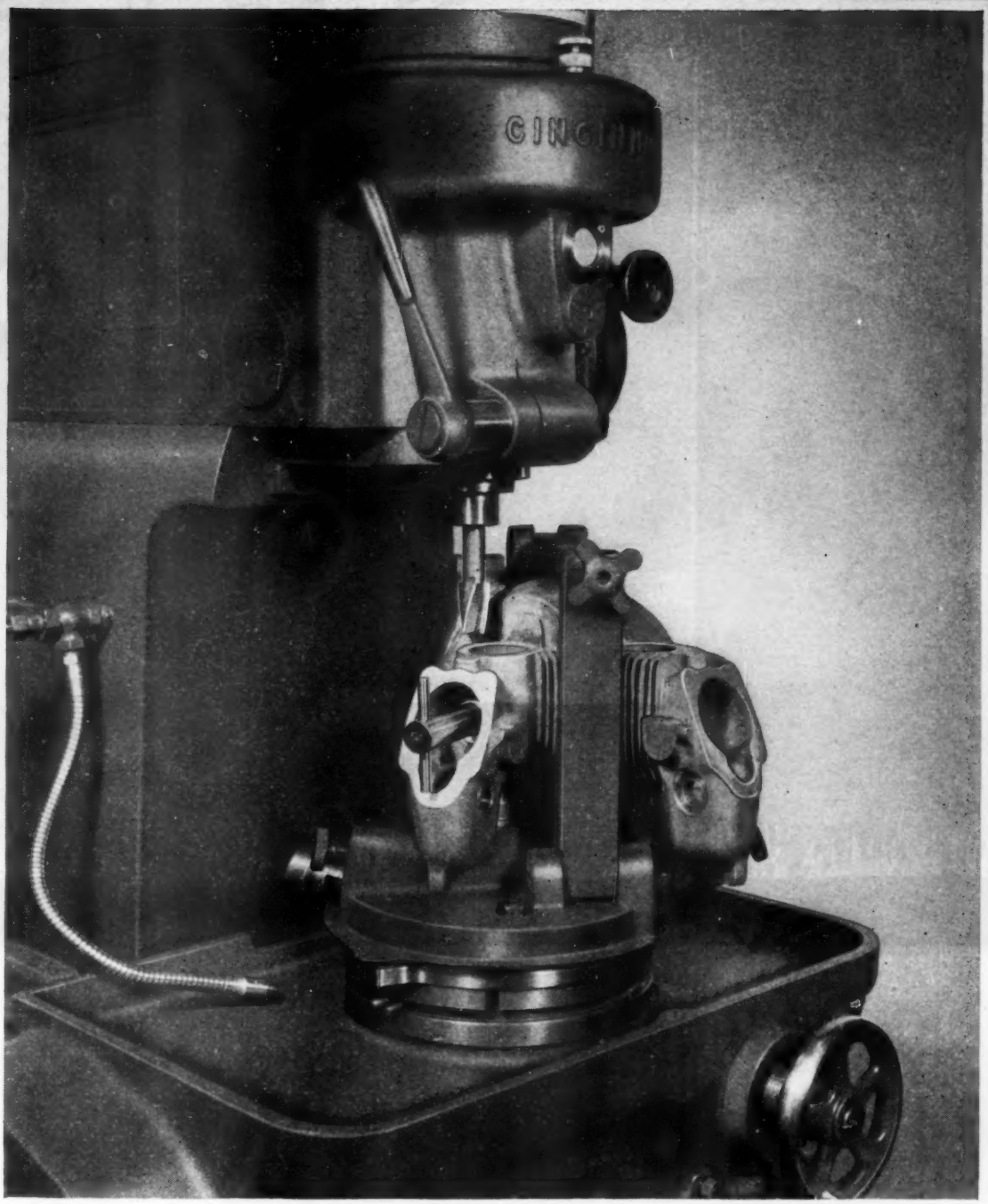


This example of CINCINNATI ingenuity solves a profile milling problem in a very simple, direct and economical manner. The part is an aircraft cylinder, and the operation consists of profile milling the intake pad, the outline of which follows closely an arc and chord of a circle. The solution is unusual in that a standard CINCINNATI 0-8 Rotary Table Vertical machine, with minor special equipment, handles the job very efficiently. A cam is placed between the fixture and the rotary table. As the table rotates, the cam, through a rack and pinion linkage and a loaded spring plunger arrangement built into the machine column, causes the spindle head to move transversely to mill the desired profile. ¶ If you have a similar problem it will prove to your advantage to consult the engineers here at Milling Headquarters.

Keep on buying WAR BONDS

THE CINCINNATI M

MILLING MACHINES



A CINCINNATI *0-8 Rotary Table Vertical Miller with special parts within column and cam secured to table to synchronize rotary movement with transverse spindle head movement.*

MILLING MACHINE CO

CINCINNATI 9, OHIO
U. S. A.

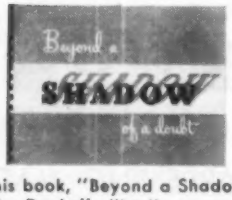
BROACHING MACHINES • CUTTER SHARPENING MACHINES

This Jones & Lamson Optical Comparator is being used to inspect the thread of a vital airplane part. Angles can be measured to within plus or minus 2 minutes of arc, and vertical and horizontal measurements can be made to .0001 of an inch.

There are people who *must* make mountains out of molehills. They are those who must detect and measure the microscopic irregularities that would, if undiscovered, swell scrap heaps, retard production and even endanger lives.

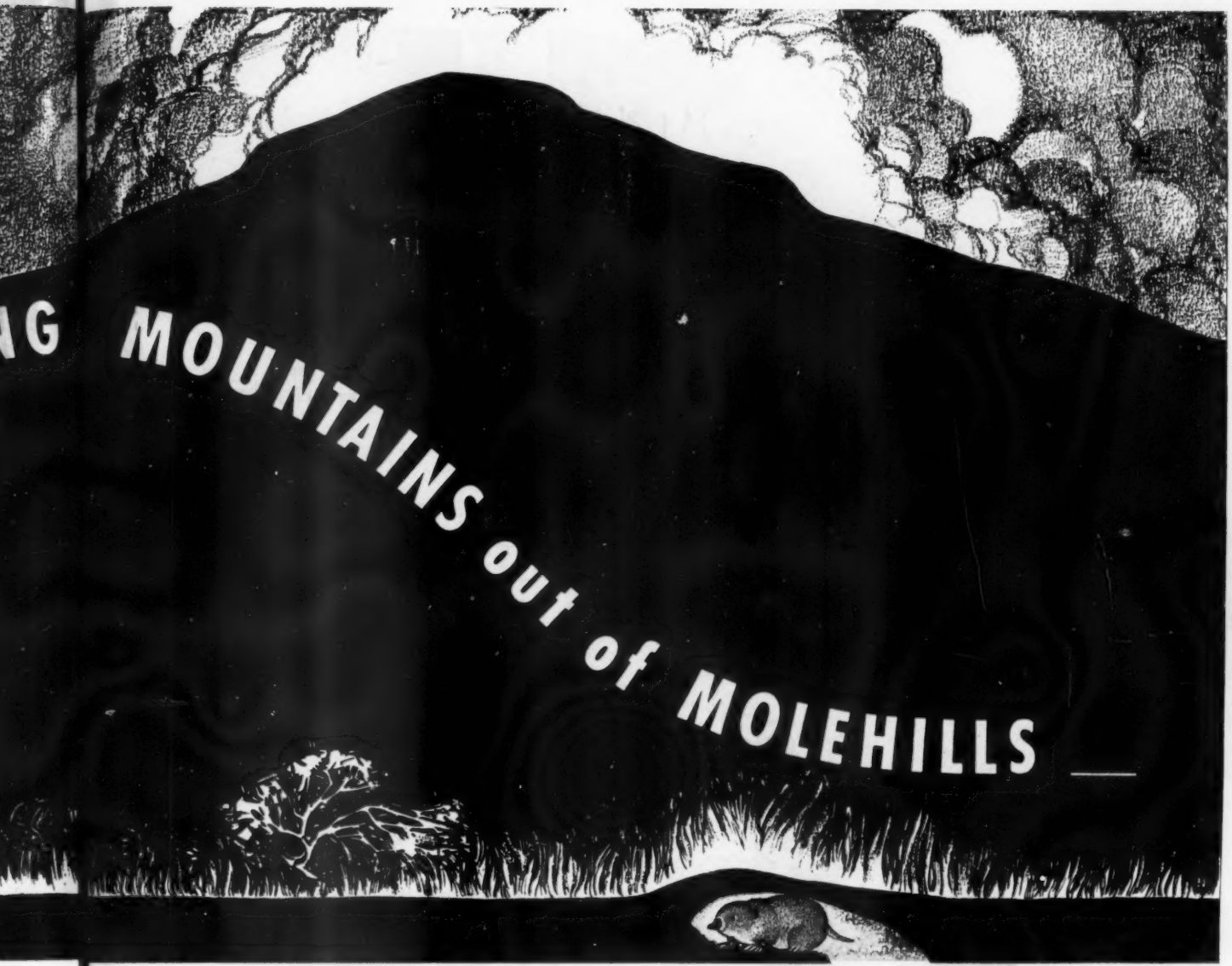
Jones & Lamson Optical Comparators enlarge minute imperfections to conspicuous size. By the use of the Comparator, inspectors of tools and products can *see* and *measure*, accurately and quickly, faults that might elude other means of inspection.

Jones & Lamson Optical Comparators are made in various models to meet every need. Ask Jones & Lamson inspection engineers how you can use them to expedite and improve inspection in your plant. Ask them today!



This book, "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

When purchasing equipment for measurement and inspection by optical projection, you should demand: 1. Precision Condensing Lens System for controlling light. 2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.* 3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness. 4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other. 5. Rigid Machine Construction.



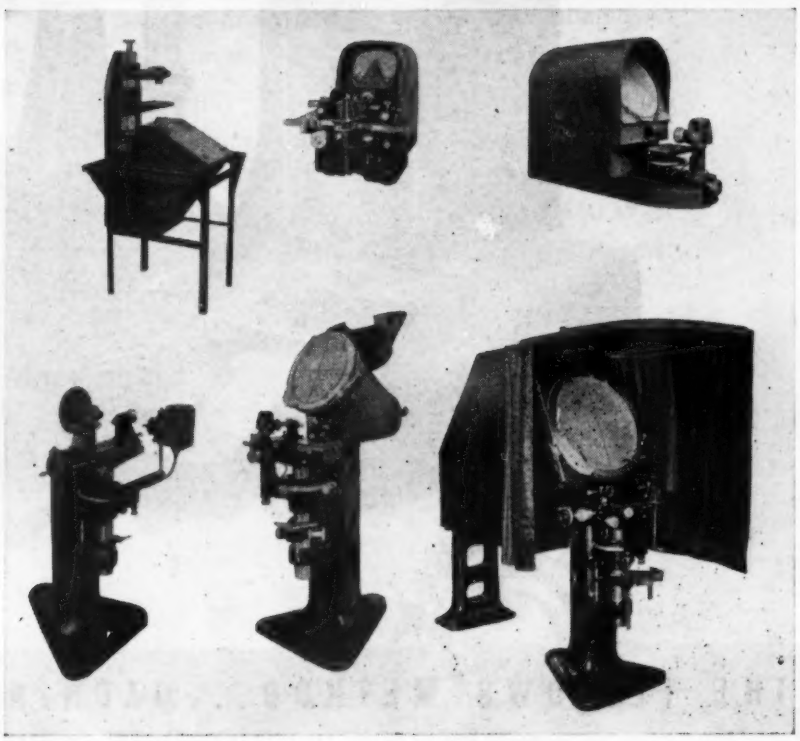
JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



Fellows Involute Measuring Machines are easy to set up and operate and dependable in performance. Standard gage blocks are employed for base circle settings.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

FLIGHT...REQUIRES *Tested* GEARS

Dawn to dusk patrolling . . . over a thousand miles of heaving sea. A brief pause at the base . . . and off again. Motor reliability? . . . It's taken for granted. But seldom is any thought given to the fact that gear inspection at the factory, too, stands guard over precious lives.

To operate smoothly and dependably in critical service, gears must have tooth profiles of highest involute accuracy. On it depends quietness and efficiency of gear action.

For checking involute profiles, Fellows has developed a Measuring Machine that operates on a new principle. A master involute cam is employed: no tapes to stretch, no sine bars to set. And by a simple setting with standard gage blocks, the machines will check any gear up to their maximum capacity . . . 12 or 24 inches. Through an electronic device, the exact nature of the gear tooth profile is charted on paper, for permanent reference. Control over inspection at all stages of production assures fool-proof assemblies and unfailing performance.

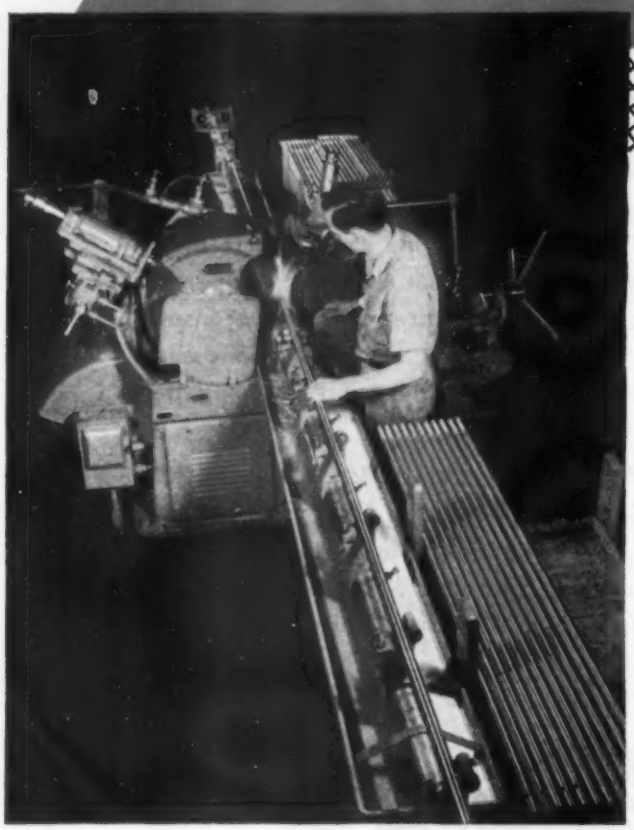
Write for the Involute Measuring Machine Bulletin. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit 2, Michigan or 640 West Town Office Building, Chicago 12, Illinois.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED

CINCINNATI

4 types of bar grinding equipment for · · · CINCINNATI No. 2 CENTERLESS GRINDERS



Did you know there are four types of Bar Grinding Fixtures for the CINCINNATI No. 2 Centerless? **Type A** Long Bar Fixture, shown in the illustration on the opposite page, accommodates bars ranging in diameter from 1/8" to 1 1/4" and lengths up to 2 1/2 feet. **Type B** Fixture is for bars ranging in diameter from 1/8" to 1 1/4" and lengths up to 8 feet. **Type C** Fixture, shown in the illustration at the left, is for bars 1/2" to 2" in diameter and lengths up to 18 feet. Then there is a **fourth** type of Fixture for centerless grinding **nonmetallic tubes and rods**, ranging in diameter from 1/8" to 3" and lengths up to 5 feet. ¶ These Fixtures are among the many

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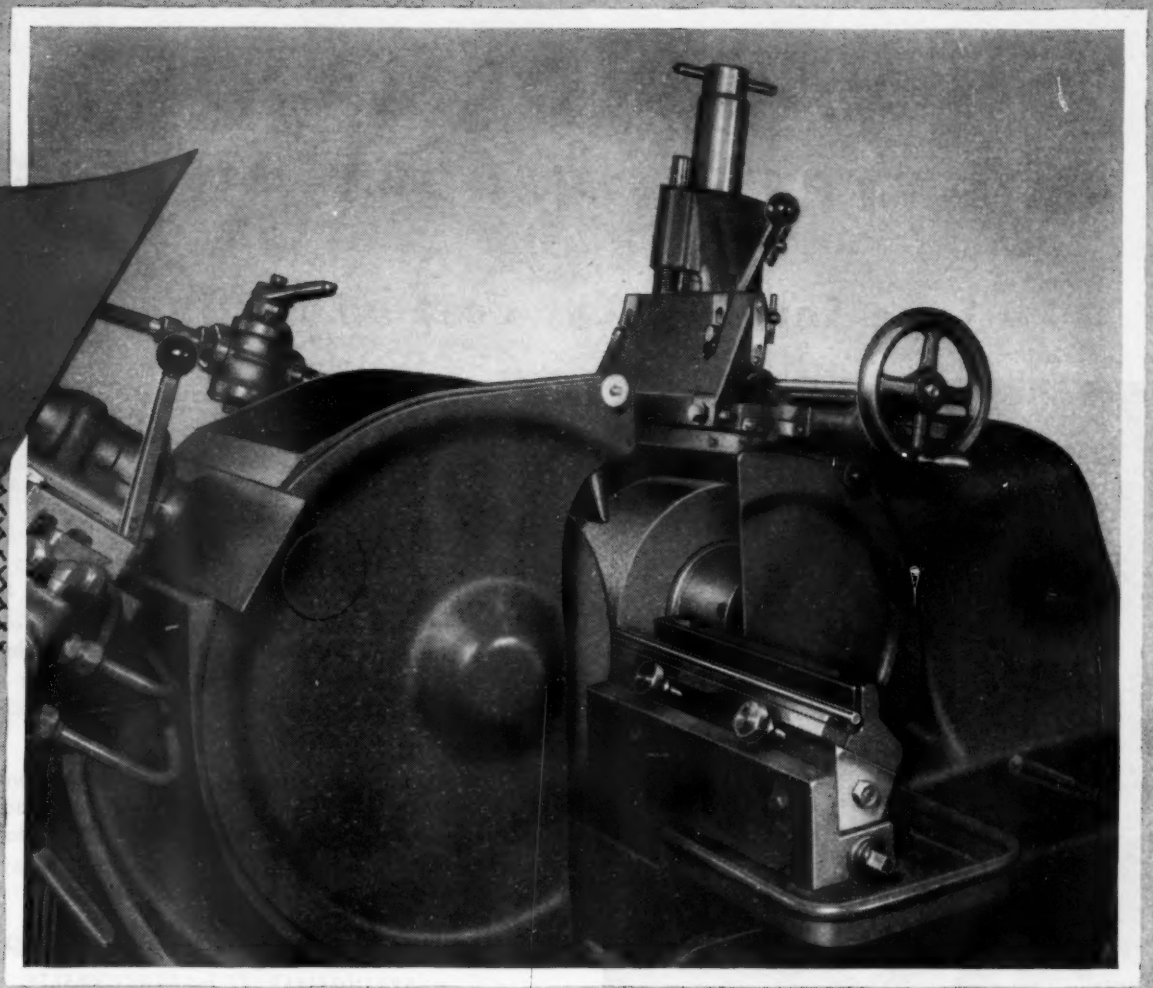
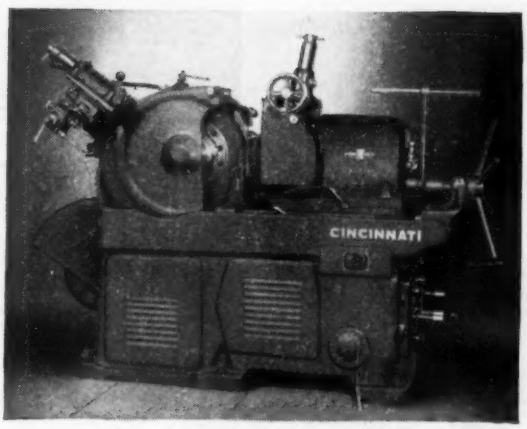
CINCINNATI

CENTER TYPE GRINDING MACHINES



developments of the engineers here at Grinding Headquarters, a group of experts who will be glad to give you the benefit of many years of both Centerless and Centertype grinding experience. ¶ At the right is illustrated a CINCINNATI No. 2 Centerless Grinder. For complete specifications on this machine, write for catalog G-456-1. Or for a brief description look in Sweet's Catalog File for Mechanical Industries.



GRINDERS INCORPORATED

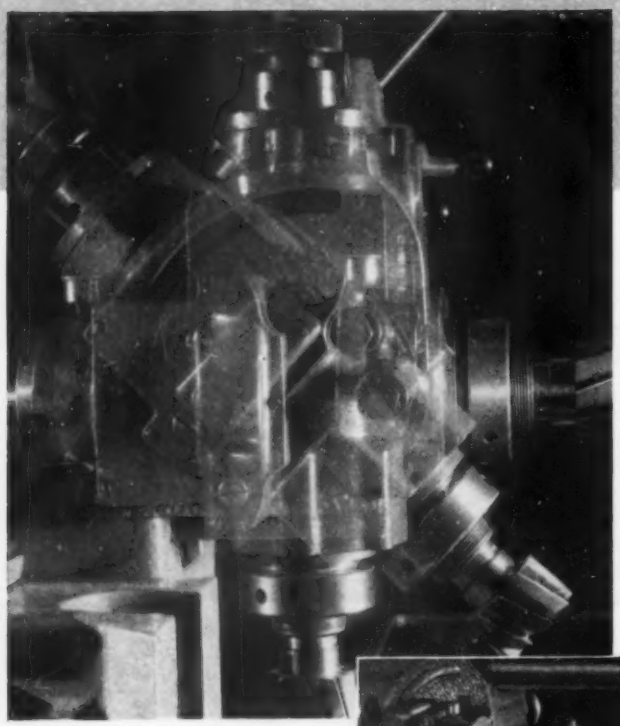
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN

RAM-TYPE UNIVERSAL MILLERS

Save Set-Ups, Cut Cost on Milling



Idle machine time, caused by reset-ups, often cuts the productive capacity of milling machines by as much as 70%.

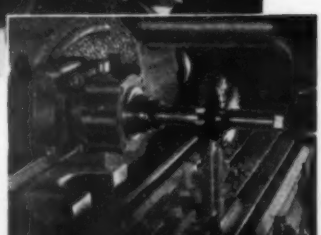
You can reduce these time-wasting reset-ups and increase machine and operator output up to 40% overall time with Van Norman Ram-Type Universal Millers.

Here's how it's done. The operator first sets up the workpiece. Then, by simply changing the position of the adjustable cutterhead from horizontal . . . to angular . . . or vertical positions, and by moving the movable ram in or out — the operator performs practically all his milling operations with minimum reset-ups. Result — faster work, greater machine capacity and less possibility of errors.

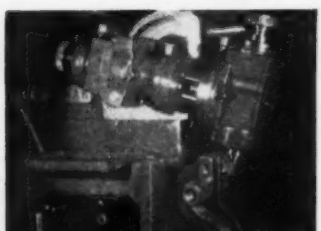
Add to the above advantages . . . directional front and rear controls of all power feeds, large easy-to-read dials . . . solid rigidity — and you'll readily see how Van Norman Ram-Type Universal Millers assure greater accuracy, increase output and cut costs.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

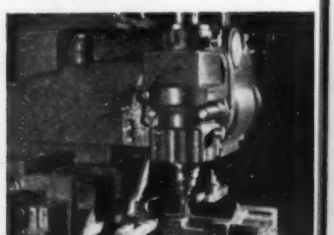
ADJUSTABLE CUTTERHEAD Gives Vertical . . . Angular . . . Horizontal Milling — All on *ONE* Van Norman Ram-Type Universal Miller.



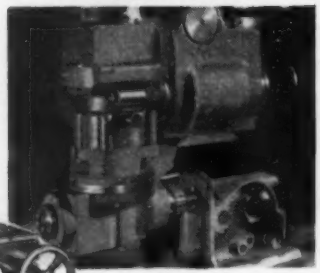
HORIZONTAL MILLING



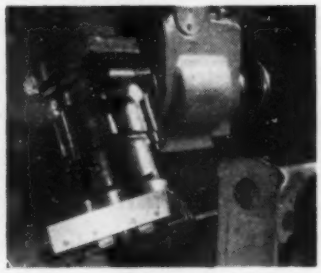
ANGULAR MILLING



VERTICAL MILLING



BORING

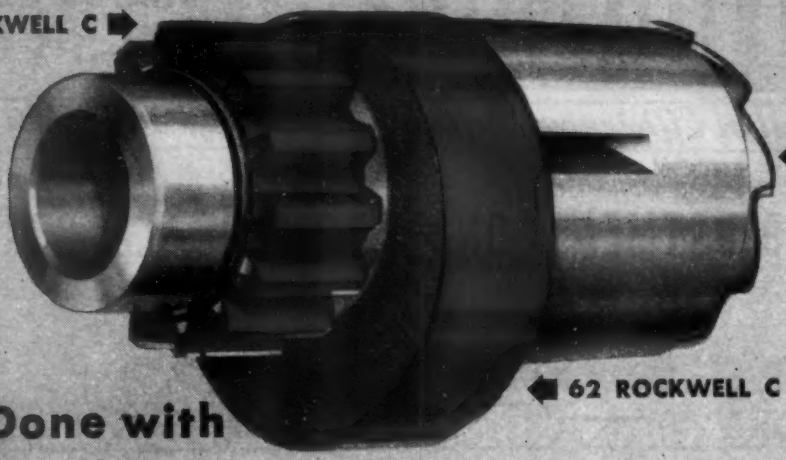


SLOTTING

ANGULAR MILLING

"It pays to

How would you solve this Differential Hardening Operation?



It Can Be Done with

VAN NORMAN HIGH FREQUENCY "Packaged Heating"

Illustrated, above, is the driving mechanism for operating an oil pump plunger. For specific design reasons, it is necessary to have the gear teeth, eccentric, and clutch teeth, which are cut integral with the shaft . . . each a *different hardness.* Since the gear teeth and eccentric are only ¼" apart, conventional methods can't be used for this differential hardening job. How would you solve this problem?

The differential hardening is easily done with Van Norman High Frequency "*Packaged-Heating*" because Van Normanizing makes it possible to control the hardened area to within a fraction of an inch.

Pictured at the right are two of the setups. Clutch teeth are hardened to 57 Rockwell C in 13 seconds; eccentric to 62 Rockwell C in 22 seconds; gear teeth, in a similar setup as clutch teeth, in 16 seconds. There is no warping or distortion and cleaning operations are eliminated as the finished part is free from scale.

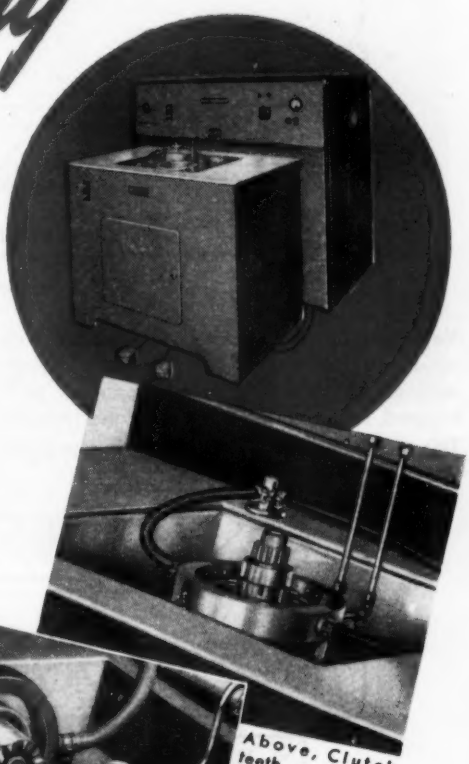
Differential hardening is but one of the many operations accomplished with Van Norman High Frequency "Packaged-Heating." Other operations include brazing, soldering, annealing, forging, melting, etc. Each can be performed faster, better at lower cost.

Investigate Van Norman "Packaged-Heating." Write for catalog today.

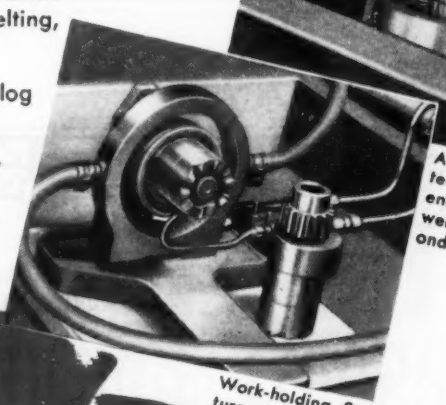
VAN NORMAN COMPANY

ELECTRONICS (N) *DIVISION*

SPRINGFIELD 7, MASSACHUSETTS



Above, Clutch teeth are hardened to 57 Rockwell C in 13 seconds.



Work-holding fixture and heating coil set-up for hardening eccentric to 62 Rockwell C in 22 seconds.

Van Normanize

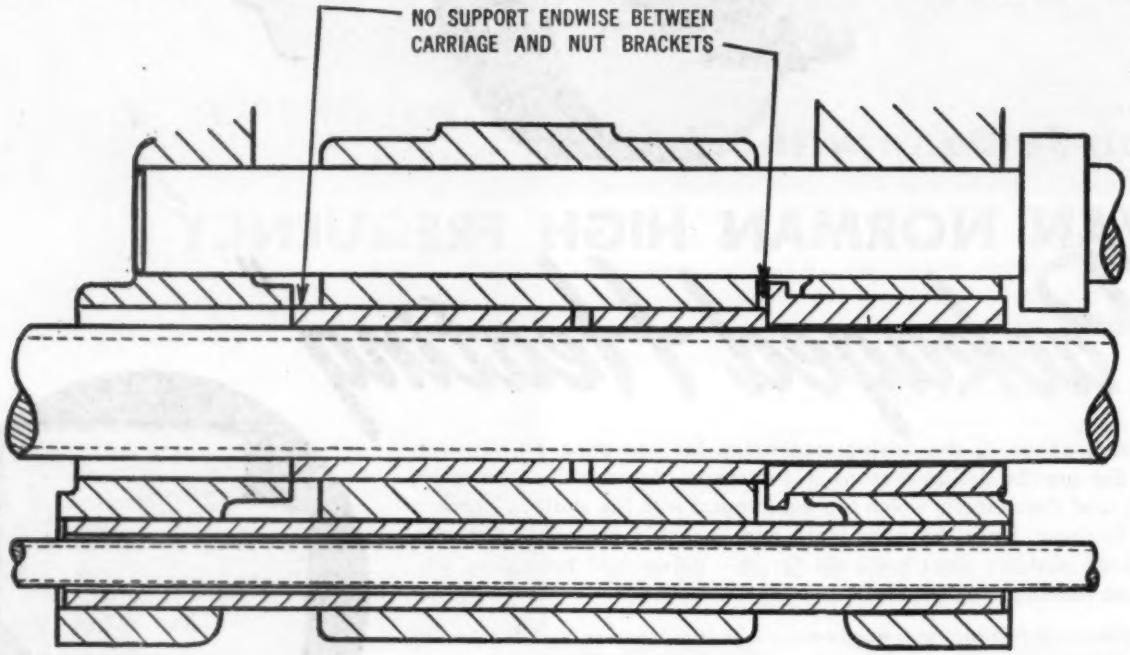
LANDIS TRADE MARK

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

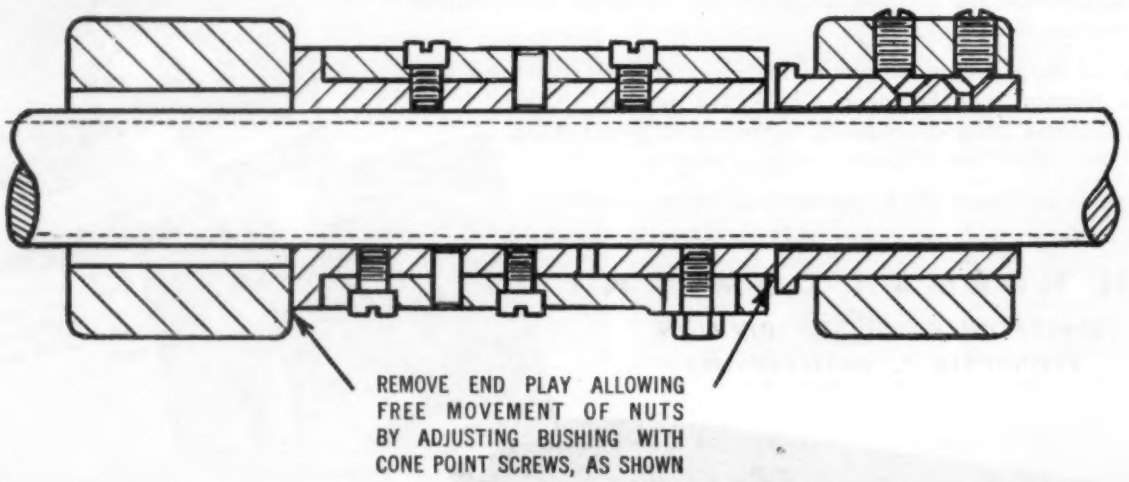
In the Interest of Efficiency, Better Workmanship and Higher Production

END PLAY ADJUSTMENT ON LANDMACO LEADSCREW NUTS



Variation of pitch diameter, especially on fine pitch threads, is caused by excessive play between leadscrew nut and adjusting bushing. When chasers are ground for use with leadscrew or tap chasers used, the chasers have no nut action. Therefore, play between nut and bushing allows nut to move in relation to carriage as head or tap is being tripped, resulting in chasers shaving thread.

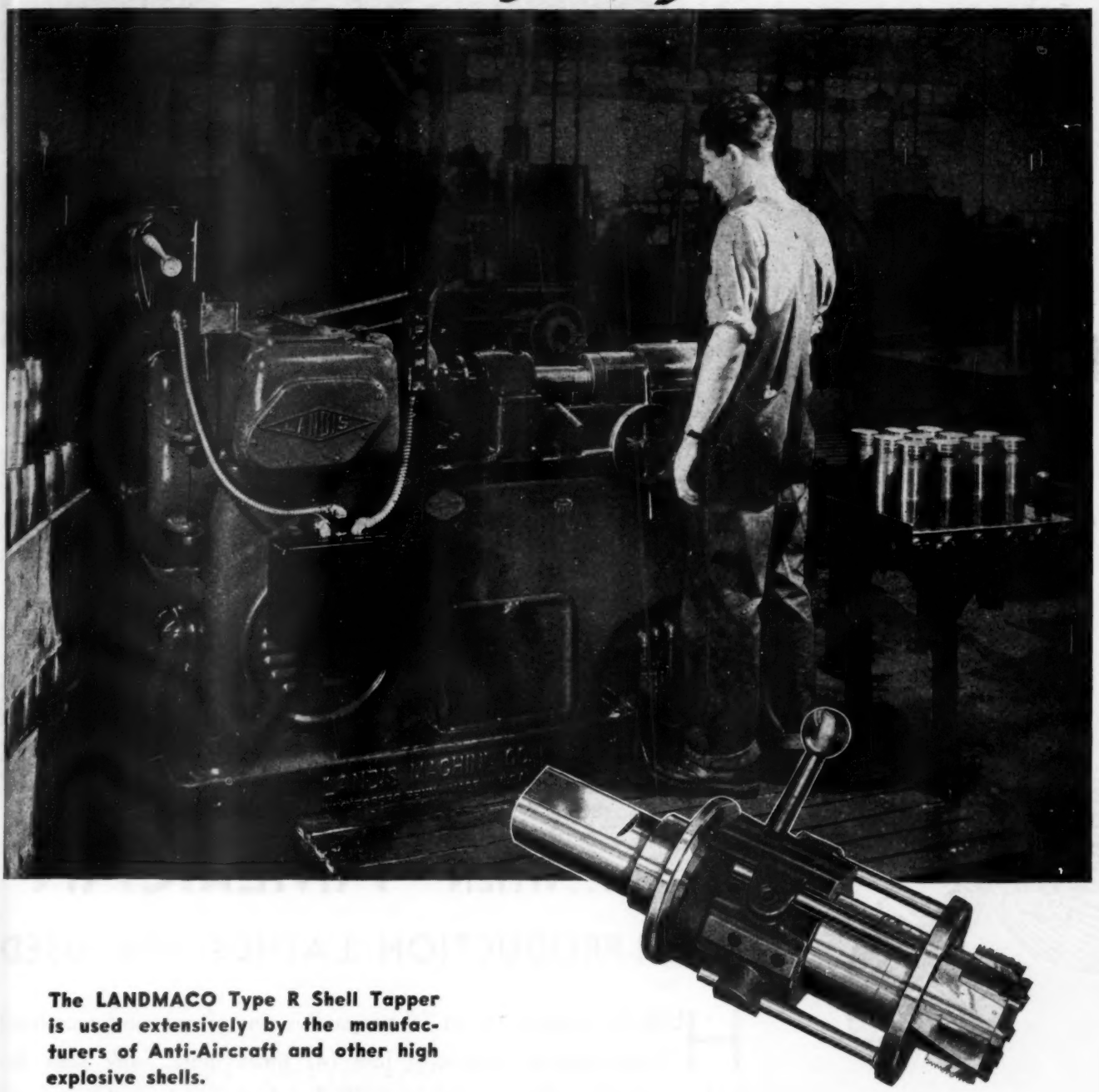
This can be eliminated by removing end play, as shown.



LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.

LANDIS
REG. U.S. TRADE ~ MARK PAT. OFF.

Accuracy + Higher Production



The LANDMACO Type R Shell Tapper is used extensively by the manufacturers of Anti-Aircraft and other high explosive shells.

The ability of the LANDMACO Type R Shell Tapper to produce threads of fine quality, well within the close tolerances required for the unerring performance of the finished product, assures maximum production possibilities for these vital war components.

Write for booklet
"Precision in Munitions Threading"

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

THE PAYROLL DOLLAR buys more

THE PAYROLL DOLLAR *buys more*

...WHEN "AMERICAN" MULTI-PRODUCTION LATHES ARE USED

HERE, for example, is an "American" in one of our most prominent shops actually producing four (4) times more work than the fairly modern machine it replaced. In hundreds of plants "American" Multi-Production Lathes are lightening the burden of higher wages, shorter hours, increased taxes and inexperienced operators. That is why "Americans" are the choice of cost-minded production men. The many productive features responsible for such results are clearly illustrated and described by our new bulletin No. 445.

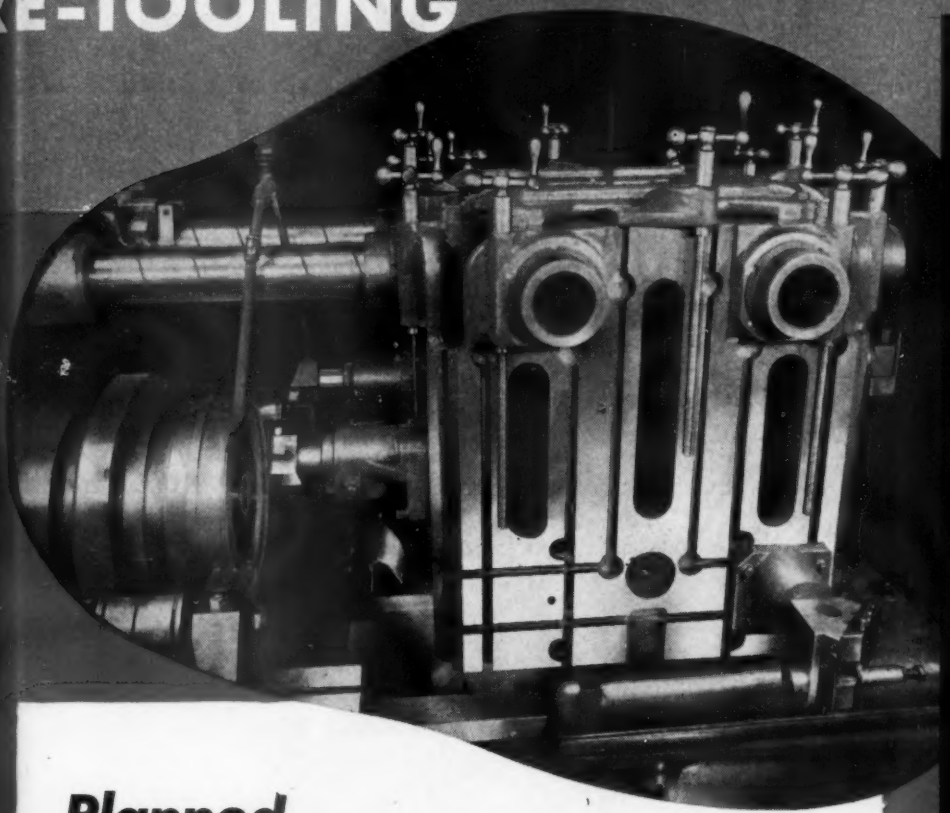
THE AMERICAN TOOL WORKS COMPANY

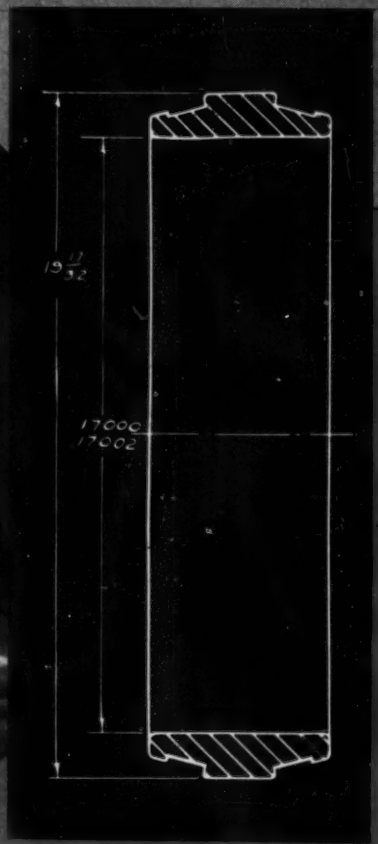
LATHES • RADIALS • SHAPERS

CINCINNATI, OHIO, U. S. A.

THE VALUE OF P&J VERSATILITY

becomes even more apparent...through RE-TOOLING





Planned Production of Bearing Cones

Here is shown a P&J 7-D Automatic tooled for turning out double cones of forged steel for large Timken Bearings for use on locomotive axles. Production was unusually high with operating costs an absolute minimum. Complete details of this job were told in these pages *six years ago.*

Planned Production Will Still Pay Dividends

Pre-war production figures can be met and bettered on the same P&J machines re-tooled for post-war jobs. The outstanding versatility of P&J equipment makes this possible. It means that your present machines tooled for a specific job are still capable of paying big dividends on other jobs. It further means that with the help of P&J engineers, you have an opportunity today to plan for tomorrow's production and be assured of achieving that low cost which will be the objective of the future.

We suggest that you start your planning now by having P&J engineers show you the practicability and economy of RE-TOOLING your present P&J equipment to meet your specific requirements.

P&J REBUILDING SERVICE

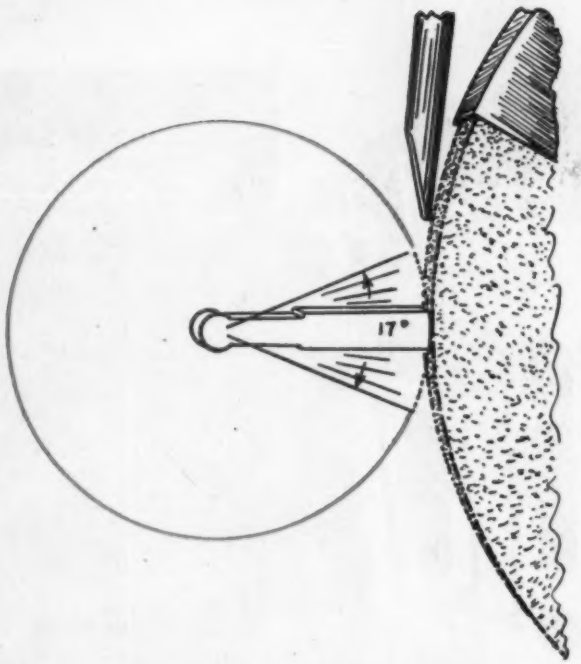
In many shops P&J machines have been subjected to long, hard service. These machines offer possibilities for rebuilding to their original accuracy and performance. All work is handled in the P&J plant by P&J experts. Re-tooling can also be handled at the same time. Investigate now.

BUY BONDS and SHORTEN THE WAR

POTTER & JOHNSTON MACHINE CO.,
Pawtucket, R. I.

DETROIT PUBLIC LIBRARY

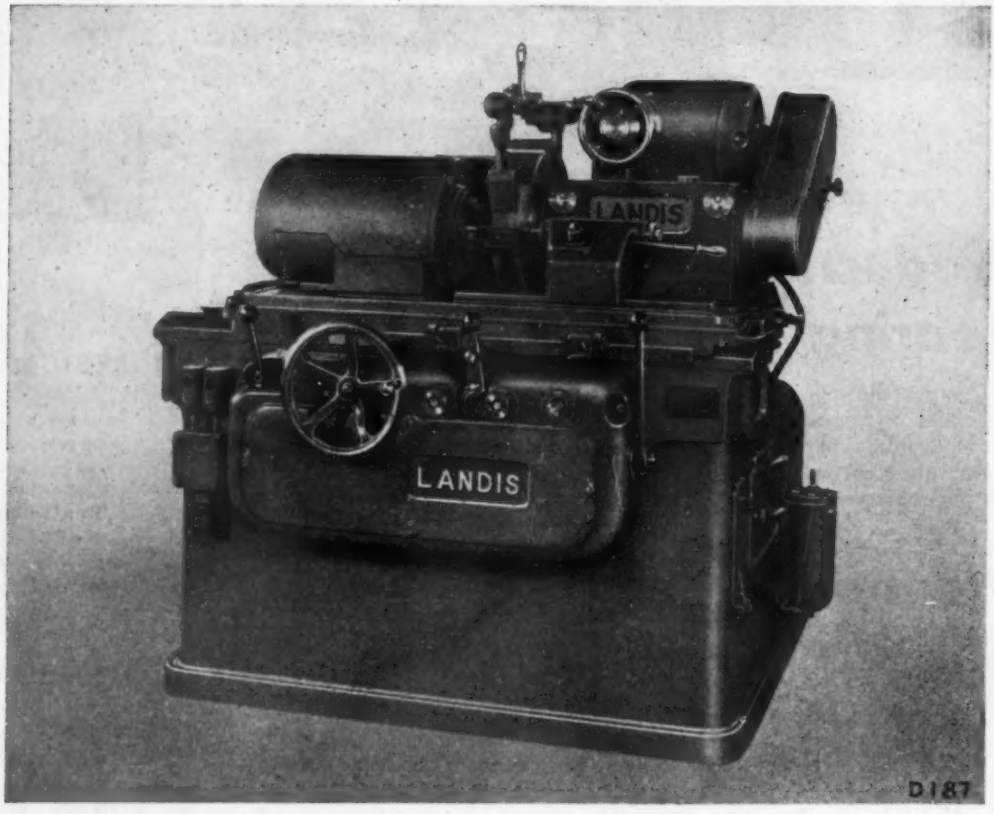
To Finish The Job Quicker . . .



WHY

Seems like an odd question, doesn't it? It has no particular point unless you are grinding a part with an intermittent cut. Then the grinding of air might prove time consuming and costly.

The drawing to the left illustrates the point quite well. It was necessary to grind the radius on a gun part known as a breech lock. About the only practical method that could be employed to hold the work was in a special fixture between centers as shown in the illustration below. Rotating the work in the usual manner would have caused the wheel to cut air the majority



PRECISION LANDIS GRINDERS

Unusual Performance As Usual

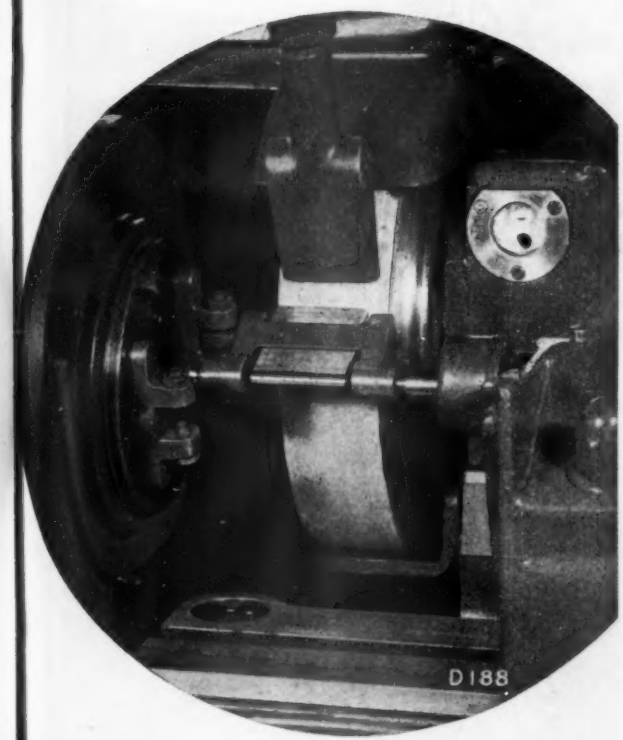
GRIND AIR?

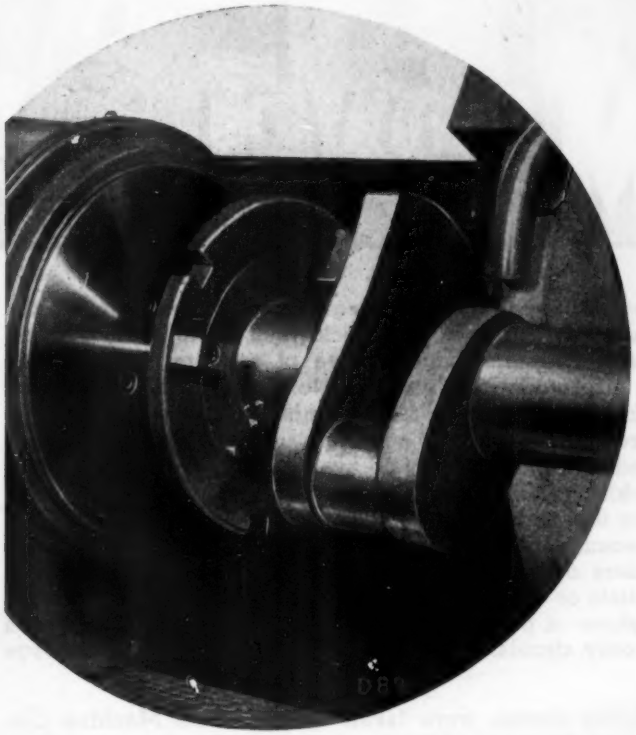
of the time because the arc to be ground was only 17°.

Solution of the problem by Landis engineers was the equipping of a 10" Type C Plain Grinder with a headstock having a hydraulically oscillated work spindle. The work, as a consequence, could be rapidly oscillated back and forth in front of the wheel. During most of the grinding period the wheel was actually working whereas, had the work been rotated in the usual manner, much loss of time would have resulted.

This method of handling has lent itself particularly well to a number of airplane crankshaft operations. One, grinding a liquid cooled shaft for balance, is shown below. Note that the radius ground in this instance is considerably greater than on the gun part but the same work spindle oscillating mechanism is used as it is adjustable for operation within a wide range.

Your grinders are not carrying their part of the load when they are grinding air. Give us the details surrounding any jobs of this kind in your plant. Maybe our experience will point the way to greatly increased production.





LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA

LANDIS EXCELLENCE

CONTRIBUTES TO VICTORY

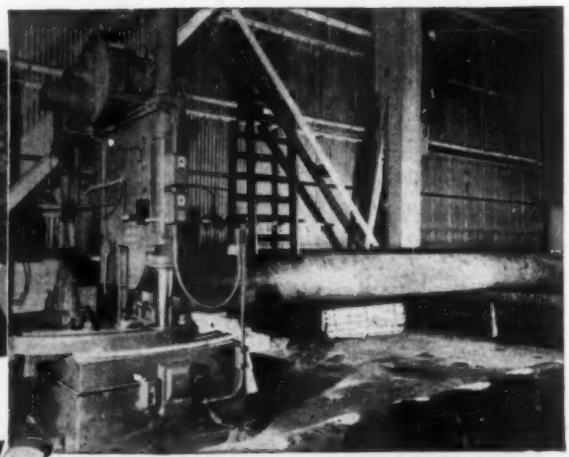
412

The MARVEL of the Year —the new

MARVEL No. 24

Super-Giant Hydraulic Hack Saw

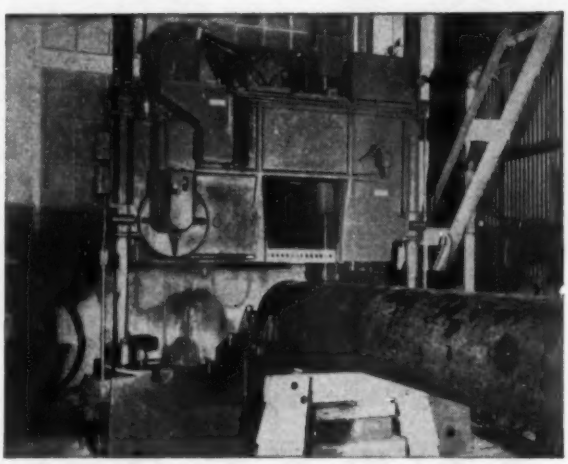
—Capacity 24" x 24"



How big is this machine? Judge from the man in the photo. Its weight, 16,000 pounds—8 tons! Twice the weight of the No. 18 MARVEL heretofore the world's largest hack saw!

The Hack Saw has grown up again! And now you can cut off large billets, forgings, die blocks, etc., up to 24 inch round or square, with the same degree of economy you cut off smaller size work. Yes, the new No. 24 MARVEL is actually a "hack saw," in spite of its mammoth size, since it employs a reciprocating blade. Of course, it uses a much larger hack saw blade than any heretofore available (36" long, 4½" wide, ⅛" thick); but it's still an "inexpensive hack saw blade" compared to the cost of large capacity circular cold saw blades. And, because this hack saw blade is comparatively inexpensive, users of the new giant No. 24 MARVEL machine will not hesitate or worry over cutting off the modern tough alloys in big sizes—a problem that has caused so many headaches where only circular cold saws were available for such large work.

The photos shown were taken at the Mesta Machine Co., Homestead, Pa.—one of the finest-equipped and most modern "heavy" machine shops in the world. The machine is shown cutting off a gigantic 24" round forging. Mesta now has three identical No. 24 MARVEL machines which are doing a fine cutting-off job on all sorts of large size alloys, faster and cheaper, without "fuss," or the nerve-racking howling and groaning of their previous circular saw methods.



This giant saw bears no resemblance to any "small size" hack saw; it follows the modern, basic exclusively "big saw" design of the No. 18 MARVEL.

Write for Catalog showing complete line of MARVEL Saw

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

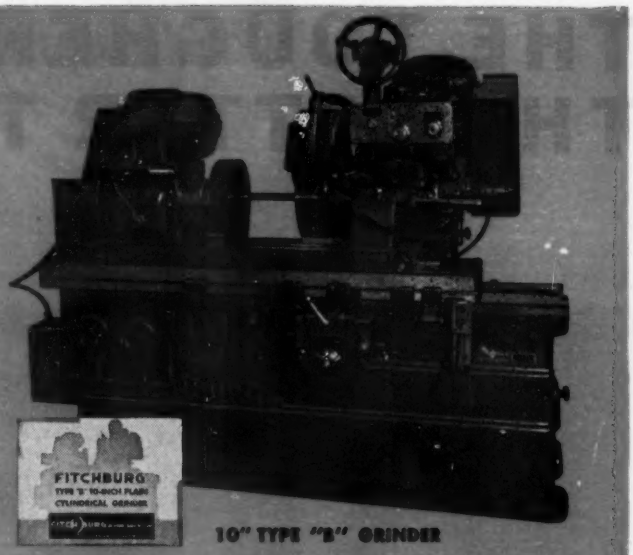
Eastern Sales Office: **225 LAFAYETTE ST., NEW YORK 12, N. Y.**

FOR GENERAL PURPOSE PLAIN CYLINDRICAL GRINDING . . . FITCHBURG *shows the way to increase production and cut costs*

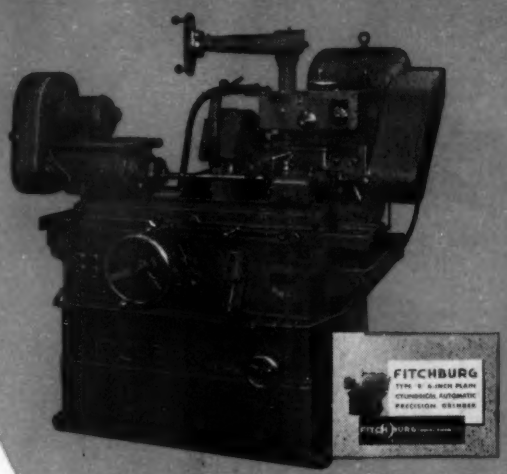
6-Inch Type "B"—The Fitchburg Type "B" 6-inch automatic precision grinder features new engineering principles that result in more economical and faster production of plain cylindrical parts. Made with 18" and 32" maximum capacity between centers.

10-Inch Type "B"—The Fitchburg Type "B" 10-inch plain cylindrical automatic precision grinder also incorporates engineering features that result in more economical and increased work production, greater accuracy, and finer finish. Made with 18", 48" and 72" maximum capacity between centers.

Type "C" Adjustable Angular Head Grinder—The Fitchburg Type "C" Angular Head grinding machine is a single application of the Fitchburg Standard Bowgage Wheelhead Unit. It is designed to handle a wide range and a number of types of jobs. The Bowgage Unit is mounted so that it may be located to grind 0 degrees up to a 45-degree included angle. Prompt deliveries can be made. Mail coupon today.



10" TYPE "B" GRINDER



6" TYPE "B" GRINDER

TYPE "C" ANGULAR HEAD GRINDER

Please mail the catalog checked.

6" Type B ☐ 10" Type B ☐ Angular Head ☐

NAME _____ TITLE _____

COMPANY _____

STREET _____ STATE _____

CITY _____ A.M.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

THE TOUGHER THE SERVICE THE BETTER THE TEST...

Many small tools are capable of handling easy jobs with a certain degree of efficiency and economy, whereas on the tough job they might not stand the gaff.

Today, most jobs are tough, calling for tough tools. Then too, because of small tool shortage, all tools must sooner or later be assigned to gruelling service making it imperative that every small tool be capable of maximum performance in long, hard work.

The test of UNION TOOLS is to put them to work under today's conditions and let results dictate the tools you buy. On such a basis UNION will be the "Tools You Buy Again."

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION TWIST DRILL COMPANY, ATHOL, MASS.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

Machine tools give meaning to this

jury's verdict!

It wasn't much of a story. By news standards today it was strictly Page 14. The night City Editor slugged it "delinquent—local" and the man in the slot gave it a one-column head. JURY BLAMES SLUMS FOR JUVENILE CRIME.

"Health stations, more hospitals and schools, recreational and training facilities, low-cost housing projects and community centers were recommended by the grand jury, in its final presentment yesterday, as measures to check the rising tide of juvenile delinquency in this etc., etc., etc."

Few people read it. In the midst of war and politics, it was strictly Page 14.

That's why we're running it. Because that story should be a Page 1 MUST in every city in America. Because that jury's verdict is a *national* challenge. Because it gives the lie to every brand of private or political complacency which turns away from one simple, unvarnished truth: Our sons are fighting for a *better* world than they left behind—and total victory is a long way off!

What has the machine tool industry to offer here? One very real contribution: The engineers of the basic machine tool producers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

One of these is a Bryant man. We invite you to send for him.

Bryant Chucking Grinder Company
SPRINGFIELD, VERMONT, U.S.A.

FAST—EASY
MOVEMENT OF MATERIALS ALL ALONG THE PRODUCTION LINE

NO STRAINING TUGGING PULLING *Nor* PUSHING

- Positive mechanical brake
- Controls in steering handle
- Forward and reverse speeds
- Front wheel power drive
- Shockless hydraulic lift with easy foot control

★Handling of this load is just as easy as it looks. More than that it is faster than any picture can show — tons just flow along — the operator accomplishes more each day with little effort — everything systematically accomplished — there's no tiring effect on the operator because there is no heavy handling or hard pulling to do.

This battery powered equipment is adaptable to short hauls and for use in elevators, narrow aisles, and areas where floor loads are restricted. It supplements larger industrial trucks to effect a complete handling system.

Write for Details

MANUFACTURERS FOR OVER THIRTY FIVE YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

59 WEST 87th STREET — DIV. OF THE YALE & TOWNE MFG. CO. — CHICAGO 20, ILLINOIS

"I See IT... BUT I STILL CAN'T BELIEVE IT!"

...one old timer's reaction to the revolutionary grinding and honing results made possible by

QUAKER MICROGRIND #132

NO WONDER experienced grinding men and abrasive engineers are frankly amazed the first time they witness the performance of MICROGRIND #132! For this *fundamentally different*, water-soluble coolant makes possible over-all grinding efficiency and a combination of advantages never before considered possible! For instance, using MICROGRIND #132 it is possible to—

- **Completely eliminate "pick-up", tears, etc.**
- **Reduce grinding checks to a point substantially less than ½ of 1%.**
- **Totally eliminate burning.**
- **Eliminate 2 out of every 3 wheel dressings.**
- **Control distortion.**
- **Develop superfine finishes, free of glaze.**
- **Increase wheel life as much as 300%.**

MICROGRIND #132 can be used with equally outstanding results on all grinding, honing and superfinishing operations. A *Quaker Process Engineer* will be pleased to call and outline to you the new concept of abrasive action around which this product has been developed and upon which its most successful application depends. If you wish, he will gladly bring in enough MICROGRIND #132 to run a test right on your own machines. Simply fill in and mail the handy reply form below.

QUAKER CHEMICAL PRODUCTS CORP.
CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

For more information on MICROGRIND #132 fill in below, tear out and mail.

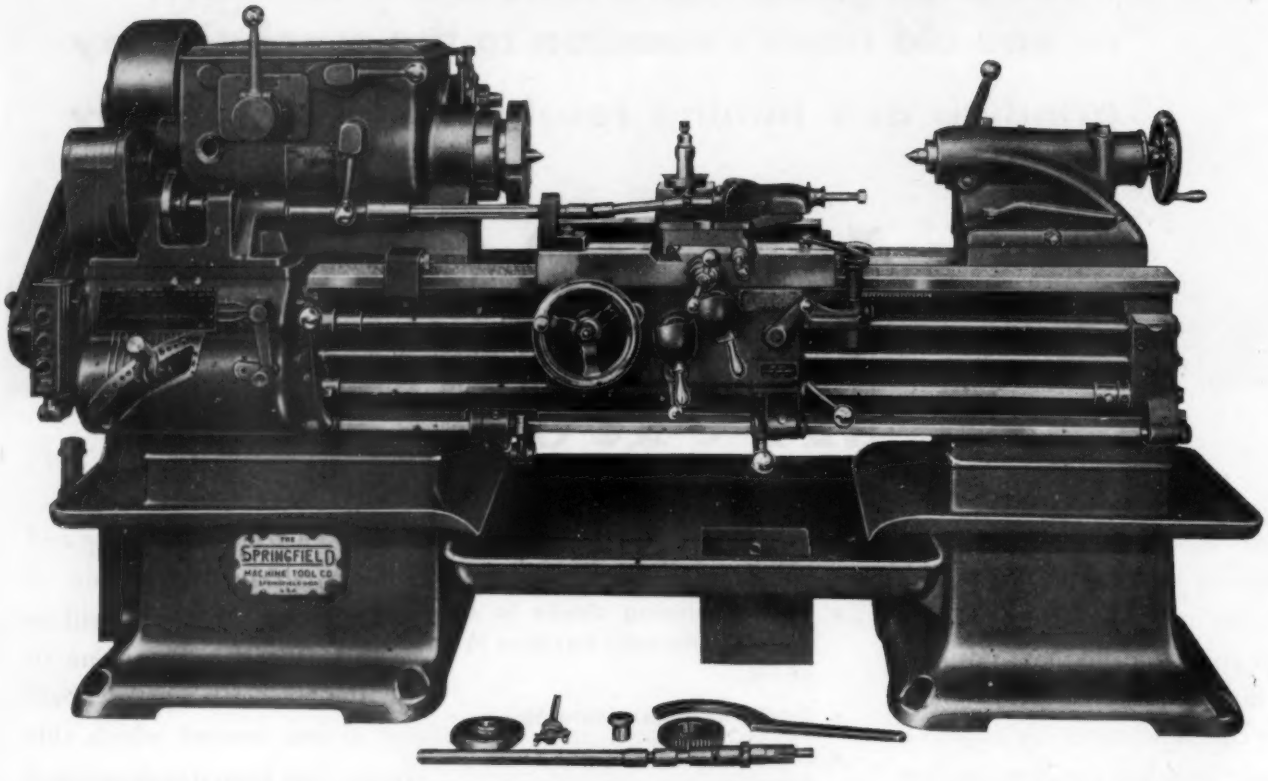
A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

...PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW...

Choose

SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELDS can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathes . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

The world's largest magnesium sheet and strip mill has recently gone into production.

Synthetic sapphires and rubies for the jeweled bearings of instruments and for spray nozzles, gages and spinnerets cost from three to six cents per carat while diamonds for this purpose cost about three dollars per carat. The making of these is an American war baby with a future.

NE alloys now make up as much as 20% of the tonnage of steel for aircraft.

A way has been found to put the "flags" (characteristic of natural bristles) on the ends of synthetic bristles for use in paint brushes.

The American chemical industry promises that it will employ more workers after the war than it did before.

Bituminous Coal Research, Inc., supported by the industry, has announced a $2,500,000 program, covering five years, with improvement in the use of soft coal as its object.

Dip-painted parts are being passed through an electrical field which removes the "tear-drop" in which the excess paint collects.

Electronic traffic control may replace the familiar signs and lights by signalling the driver through his dash radio.

The strongest natural fiber is Ramie, cultivated in Egypt 4,000 years ago. It is now being grown in this country and, if practical processing methods can be devised, it is expected to appear among our new textiles.

The new Orthicon camera has an "eye" composed of 400,000 pieces of light-sensitive silver which store voltage proportional to the light cast on them. It will be used in television and is said to be ten times as efficient as the iconoscope previously used.

Photo-electric cells check hand grenades at the rate of 4,000 per hour. When a defective unit appears on the conveyor, the mechanism rings a bell, lights a lamp, puts a dab of paint on the grenade, and makes a mark on a chart.

A new process for drying the paint on army tanks does the work in four minutes while the operator drives the tank through the "oven."

The use of the thyratron tube as a rectifier makes possible the use of an A. C. current supply to drive D. C. motors, the advantage being in very exact control of speed.

Extremes of temperatures encountered in flying have made necessary the development of new and better cements to replace the Canada balsam formerly used in the making of lenses.

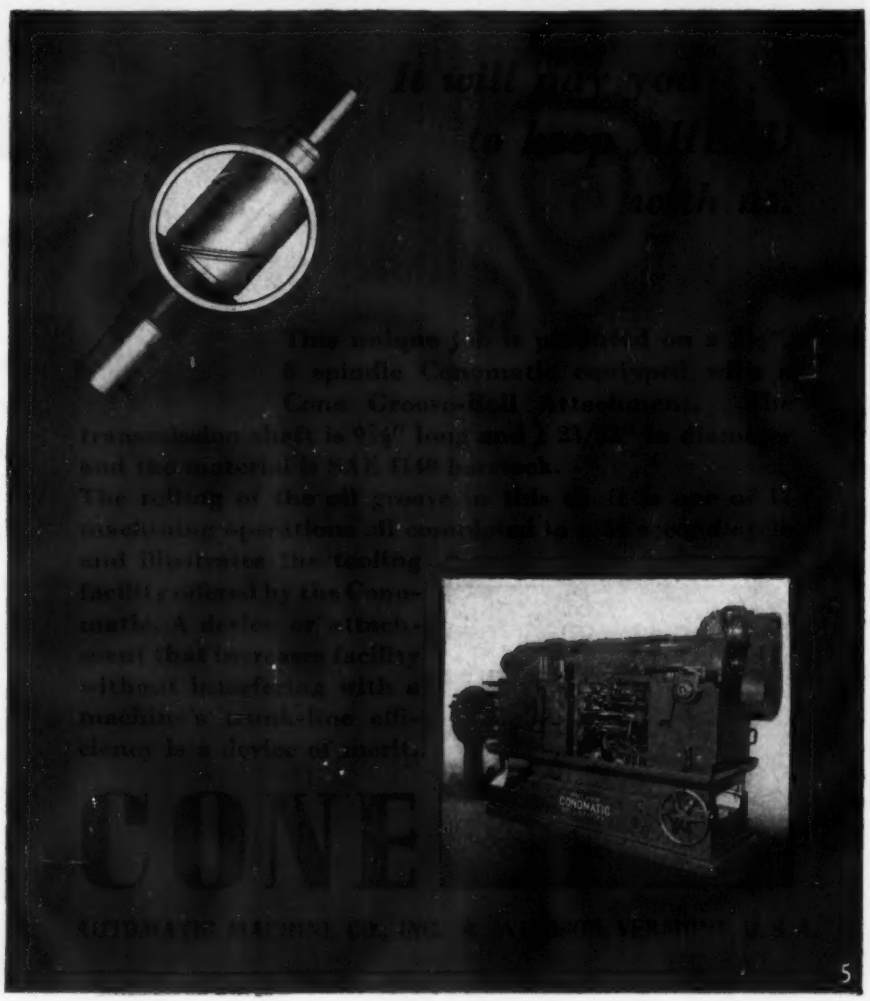
The cost of Diesel-produced electric power is expected to be cut in half as the result of war-time developments.

Street cars designed for post-war production will be lighter, quieter, better looking, and more economical in operation. They will have more comfortable seats and the windows will be higher to give strap hangers a better view.

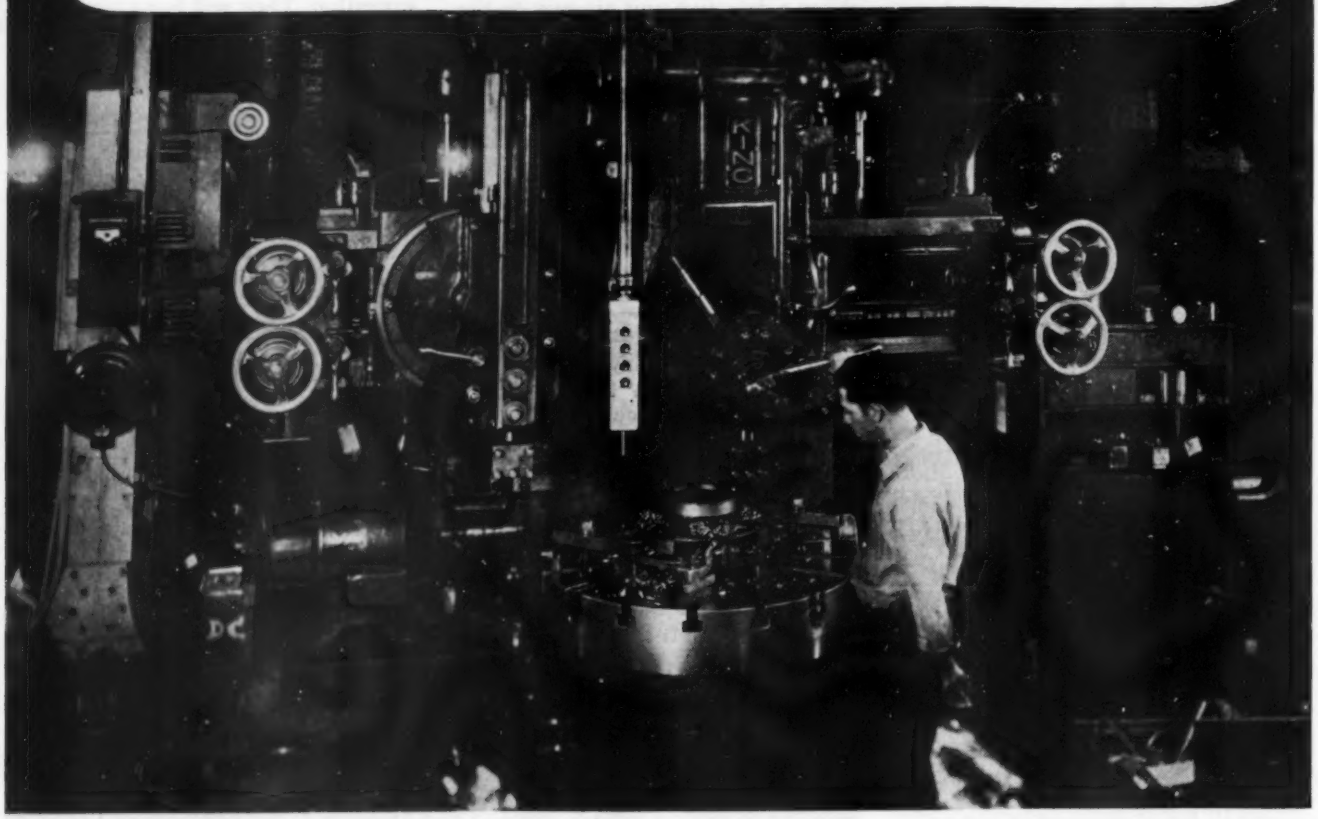
A new fluorescent lamp, about the size of a marble, uses only two cents worth of current a year.

A new electronic method of sorting metals detects differences in material, alloys, heat treatment and thickness.

Success of the "bazooka" against enemy tanks has called public attention again to the rocket or reaction engine as a source of power. Such a motor has been constructed, for experimental use, that develops 260 horsepower for each pound of its weight. One horsepower per pound is the approximate output of the lightest internal combustion engines.



For High Production of Precision Work



KING *Vertical Boring and Turning Machines*

● This King 42 inch Vertical Boring and Turning Machine is turning a bearing housing of an electric motor. The piece is being turned for fit in a gear case. Material is cast steel.

This is just another instance of King versatility and precision meeting specific requirements accurately — quickly — and at low cost.

Whether your job is of cast iron — steel — or a non-ferrous material if it requires turning — boring — facing or some similar operation you can do it better — faster — at lower cost on a King Vertical Boring and Turning Machine.

King offers a full range of sizes from 30" to 40" single column types and up to 12 feet in double column types.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

Versatile . . .

In Construction . . In Application

THE particular field of the Norton Universal Multipurpose Grinder is in miscellaneous, small-lot general production, in difficult applications, or in tool room work.

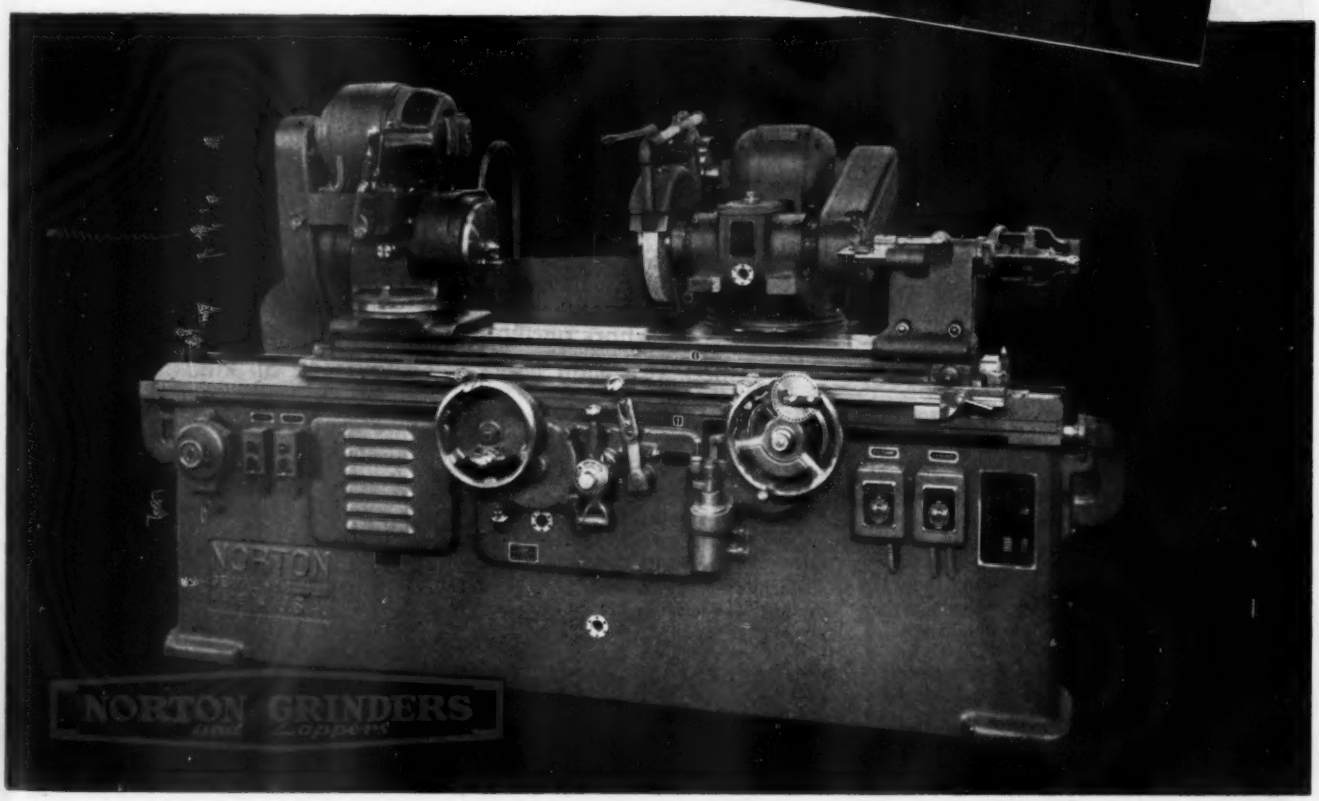
Its standard equipment, mounted on a massive base, gives versatility to handle a variety of work quickly and accurately. Headstock, footstock and wheelhead are completely self-contained with swivel features to give adaptability of settings.

Within arms' reach of the operator's normal position are all the principal machine adjustments and operating controls. Units may be moved to any desired position on the flat-topped table. Such features contribute much toward operator comfort — minimizing fatigue and promoting rapid, accurate production.

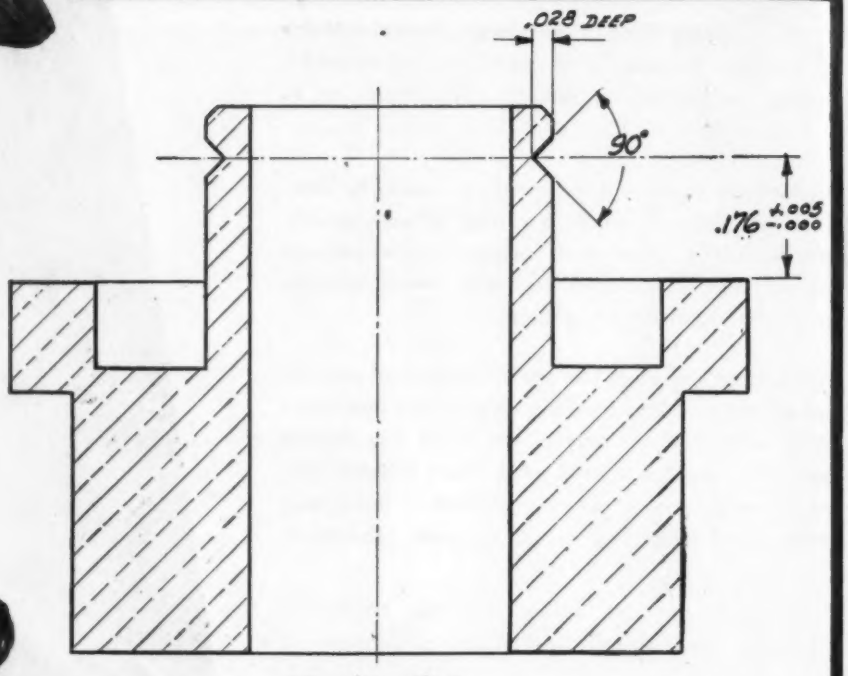
A new pictorial folder on the Norton Multipurpose Grinder will be sent on request.

NORTON COMPANY
Worcester 6, Mass.

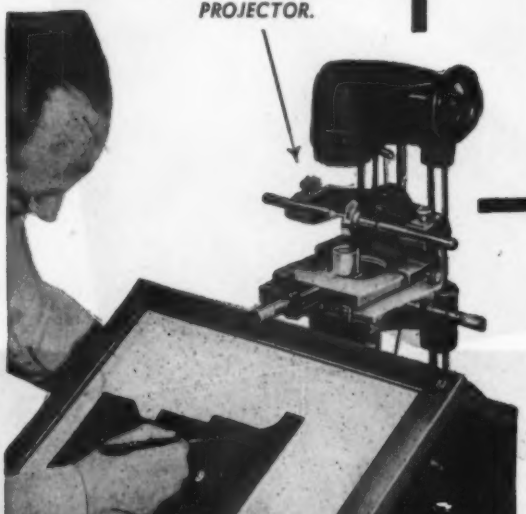
New York - Chicago - Detroit - Cleveland - Hartford



This part is inspected in SECONDS . . .



Checking a circular form tool on the WILDER PROJECTOR.



on the WILDER PROJECTOR

The part shown here is typical of the wide variety of work that can be checked on the WILDER PROJECTOR. In this specific case, three dimensions including an angle can be inspected in one operation. The work piece is quickly located on a simple fixture and checked against a drawing. Errors, 12½ times magnified, show up on the screen in front of the operator.

The WILDER PROJECTOR has many applications in every machine shop and plant and is a great time-saver as an optical precision checker on work of all kinds.

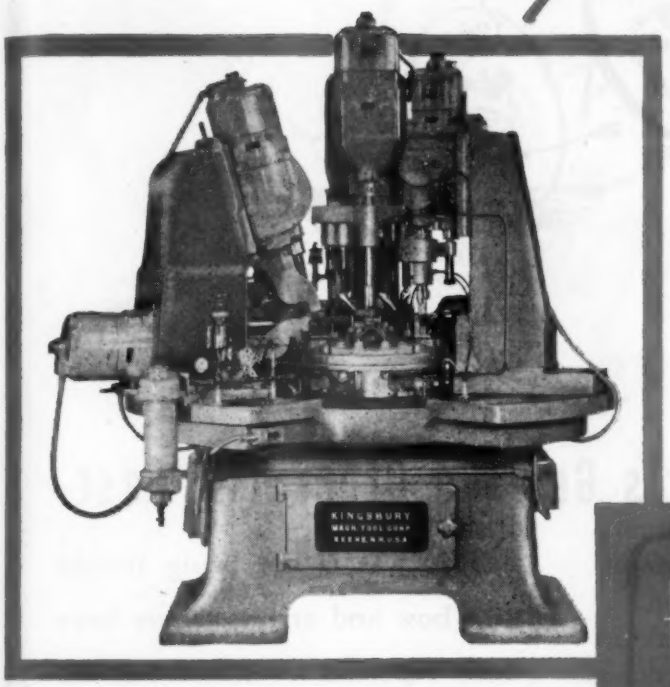
Advantages and Typical Applications in Inspection

1. It makes possible faster and more positive inspection by eliminating the uncertain human element of "feel."
2. It enables you to see exactly on a greatly enlarged image where tools, templates, gages, as well as parts in process vary from specified dimensions or contours.
3. And when you see exactly where and how much the errors are, it is easy to correct them, before they get into production.
4. It enables you to verify machine settings by quickly checking the first few parts, thus avoiding rejects.
5. It facilitates the control of tool wear through periodic inspection of parts in process.
6. It is ideally suited for 100% inspection of the finished parts, where perfect interchangeability in assembly is required.

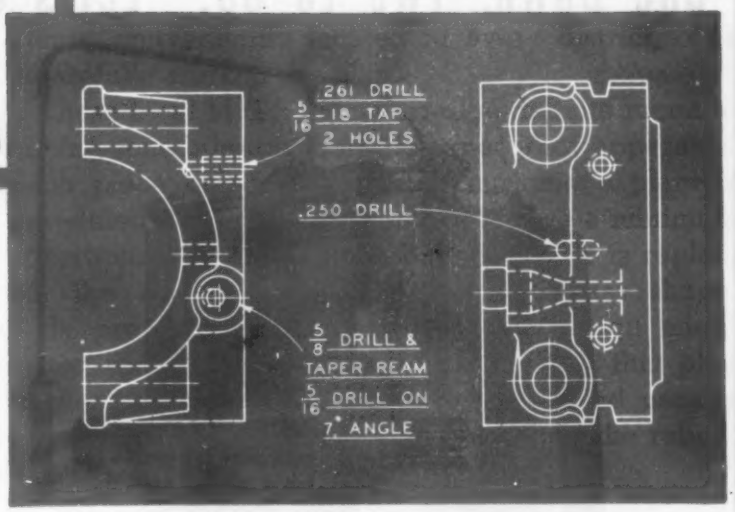
WRITE AT ONCE for NEW folder describing the uses of the WILDER PROJECTOR. You'll find several applications covered in this folder that suggest practical ways and means of reducing your measuring and inspecting time and eliminating complicated time-consuming methods.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

FLEXIMATIC
by KINGSBURY



Three operations from three different directions handled in a single chucking of the work . . . . . .



The advantage of the KINGSBURY FLEXIMATIC method for performing various machining operations in a single chucking of the work is exemplified here. The parts involved are automobile rear main bearing caps which are drilled, reamed and tapped on a Model GD FLEXIMATIC from three different directions without rechucking. All operations occur simultaneously during unloading and loading.

Obviously, ability to handle work of this nature in the way it is handled on a FLEXIMATIC means outstanding production capacity. To this advantage must be added the precision which characterizes FLEXIMATIC performance—a combination which is of such outstanding value today because it makes every minute count in high speed precision production. Furthermore, KINGSBURY FLEXIMATICS conserve man power through the ability of one operator to easily out-step the productivity of several men on general purpose machines.

Basically, the FLEXIMATIC is an automatic indexing machine built up of a number of standard specific operation units in such a way that *all* operations can be performed in a single chucking of the work. By the Kingsbury-pioneered FLEXIMATIC method, unique, flexible and versatile machines are available not only for fast, accurate production but also for quick set-up and convenient change-over.

KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U.S.A.

You Can't Miss With a Hypro

One Down, Two to Go. Let's Get the Other Two Fast.

This war is not being fought with bow and arrows. They have been replaced by numerous improved implements of war.

Antiquated methods have been discarded. Obsolete machine tools should be replaced.

Help Uncle Sam win this war fast. Remove those inefficient tools. Increase production the Hypro Way.

Write for Bulletin 153A illustrating Cincinnati Hypro Machine tools.

Hypro Means Hypro-duction.

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

Many motor-generators and rotary converters well along in years must be kept on the job these days. But their aged insulation is a constant trouble threat in case of overloads.

Over-Age Generators

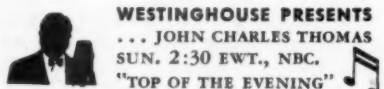
GET A NEW LEASE ON LIFE

To prevent breakdowns as a result of insulation failure, Westinghouse *Manufacturing and Repair** Plants, conveniently located in every district, offer a carefully worked-out plan.

These local M & R Plants arrange definite reconditioning schedules on short-life-expectancy apparatus. Each piece of equipment in a customer's plant is scheduled for repair when it will involve a minimum interruption in production. Old insulation is replaced, the equipment returned in first-class shape.

By preventing unexpected failures which might cause serious damage to the apparatus, this plan eliminates long production shutdowns. And usually reconditioning permits heavier loading of the rebuilt equipment, thus increasing production.

This economical and efficient plan, endorsed and used by many industries, is typical of Westinghouse M & R service. This nationwide organization, with local branches as near as your telephone, is equipped to give you complete, dependable repair service on any type of electrical equipment. J-90523



WESTINGHOUSE PRESENTS
. . . JOHN CHARLES THOMAS
SUN. 2:30 EWT., NBC.
"TOP OF THE EVENING"
MON. WED. FRI. 10:15 EWT., BLUE NET.

When vital electrical equipment needs repair . . . phone the nearest office of Westinghouse Electric and Manufacturing Company for

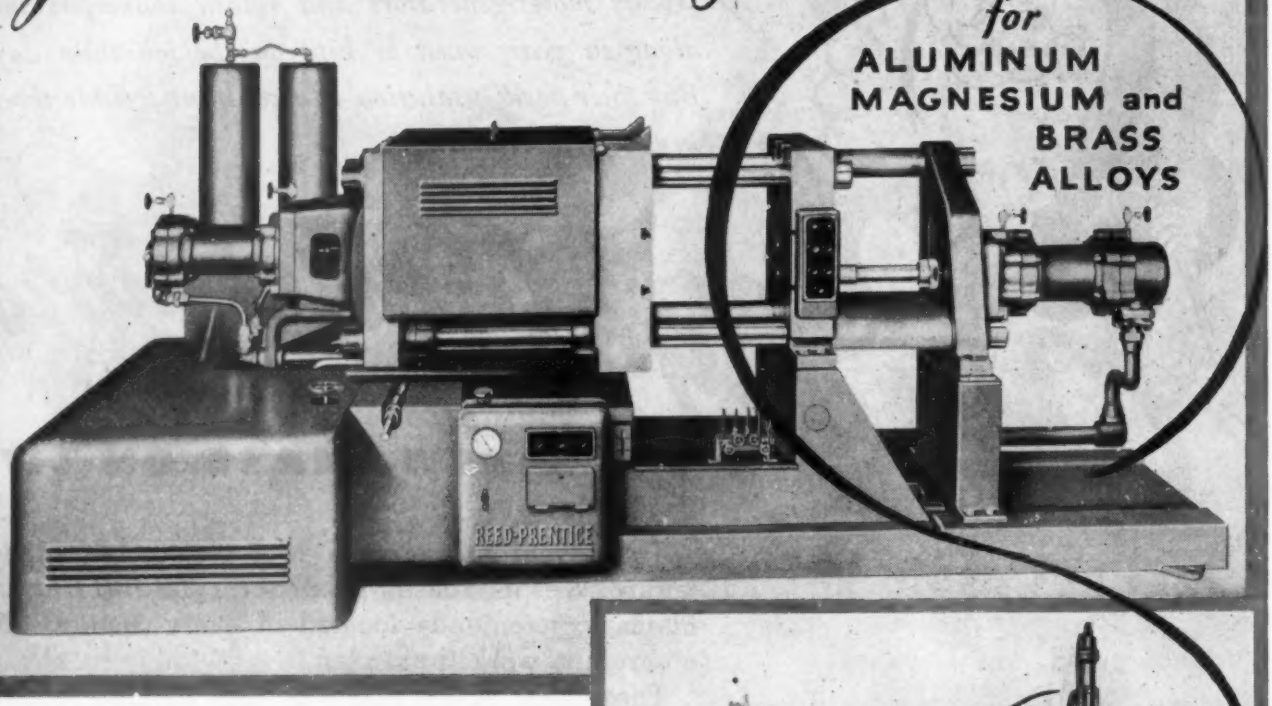
Westinghouse

COMPLETE REPAIR SERVICE

*33 M & R PLANTS • • ONE NEAR YOU

Greater Flexibility IN DIE CASTING

for ALUMINUM MAGNESIUM and BRASS ALLOYS



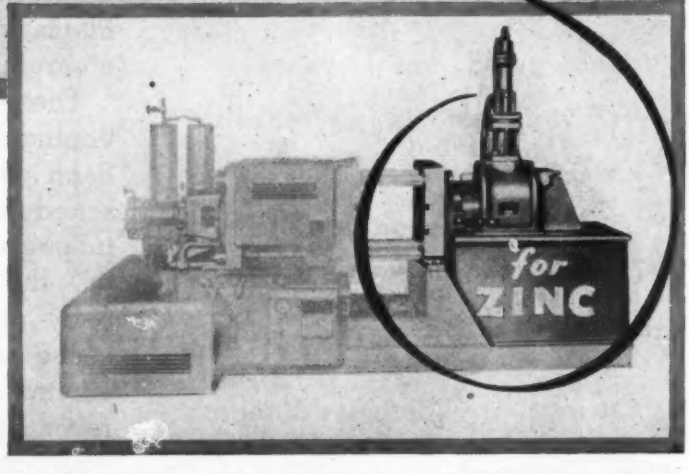
No. 1½G REED-PRENTICE High Pressure Cold Chamber Die Casting Machine

• •

Design and construction of these new and improved die casting machines provides for quick change from 1½G type for use with Aluminum, Magnesium and Brass Alloys, to 1½ type for Zinc, Tin or Lead Base Alloys, or vice-versa. Cold Chamber Attachment or Furnace Attachment can be purchased separately, thereby keeping investment cost to a minimum where but one machine is desired. Change from one type to the other is readily made in but 4 to 5 hours.

SPECIFICATIONS:	No. 1½G	No. 1½
Size of die plates	28" x 29"	28" x 29'
Space between bars	15" x 18"	15" x 18'
Dies Open	10"	10"
Maximum die space	18"	18"
Minimum die space	6"	6"
Capacity melting pot (Zinc)	——	700 lbs.
Weight	12,500 lbs.	15,500 lbs.
Motor, H. P.	15	15

Send for circulars of these new No. 1½G and No. 1½ Die Casting Machines, also larger No. 3G High Pressure Cold Chamber type machine.



No. 1½ REED-PRENTICE Die Casting Machine

FEATURES:

One-piece welded base and hydraulic tank.
Improved linkage with electric steel members, nitrided pins and hardened steel bushings.
Heavy steel castings for die plates.
Improved hydraulic circuit to increase speed of cycle.
Electrically operated hydraulic control with new control panel.
Both manual and semi-automatic control with electric interlock for operator's safety to prevent shooting of metal until dies are securely closed.
Arrangement for automatic ejection of castings and ready application of core pulling cylinders for operation thru electric pushbutton station.

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland 13, Ohio
75 West St.
New York 6, N. Y.

REED-PRENTICE CORP.

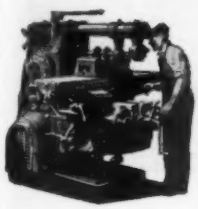
MAIN OFFICE
WORCESTER 4,
MASS. U. S. A.

Will your products be on the Salesfloors of the better Dealers tomorrow?

What will your †† future **I.P.** *be?*

This is the Fifth of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

. . Your Company's **I.P.** May Be The Deciding Factor



THE return to peacetime production won't be accomplished without industrial "casualties"—every realistic business thinker knows that some mortality is inevitable in such adjustment.

Farsighted planning now will enable many companies to carry on and through — they will re-establish and hold places for their products on sales floors of the better dealers tomorrow.

Such planning recognizes that there will be many problems beyond the control of management — to be met as they arise with immediate resourcefulness. Well-conceived, thorough postwar plans of action concern themselves properly with the known factors—the anticipated trends of the peacetime future.

It is a certainty that even well-known, long established industrial firms will encounter new competition — new, aggressive organizations, unfettered by any traditional methods of manufacturing and marketing, who are determined to challenge the places which older, prewar companies believe they hold in the industrial world.

And it is another certainty that buyers in the postwar world won't differ materially in their usual habits — they will want values for their dollars, not mediocre products at de luxe prices. Those manufacturers, whether entrenched or newcomers in a given market, who are best equipped to provide better products at attractive prices can expect to fare best in the coming battle of competitive production. To make better products—at lower cost—will demand production-engineering skill implemented with the best modern machine tools.

Such production has its roots in man-hour output. Only by maintaining or excelling our expected national *industrial par* can we attain security of jobs and wages for the greatest number of workers. The vital significance of *industrial par* to industry is summarized in the panel headed "Spotlight Facts for Your Future I.P. Planning."

In the new competition — postwar — the farsighted manufacturer will look to the most modern and advanced machine tools as the most effective means of maintaining *industrial par* and its benefits in terms of employment — better production at lower cost.

Let's all Back the Attack! **BUY MORE BONDS**

Spotlight facts for your future **I.P.** *planning*

- ✻ Production methods — developed in wartime —increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
- ✻ The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.
- ✻ Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
- ✻ Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
- ✻ The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

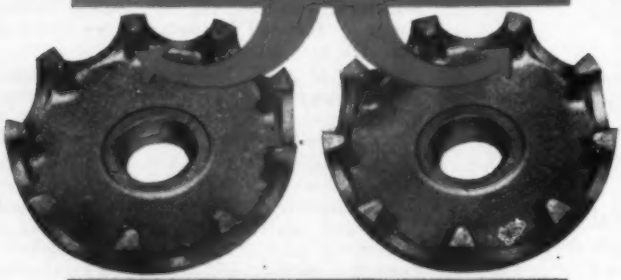
KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14 WISCONSIN

Milwaukee Machine Tools

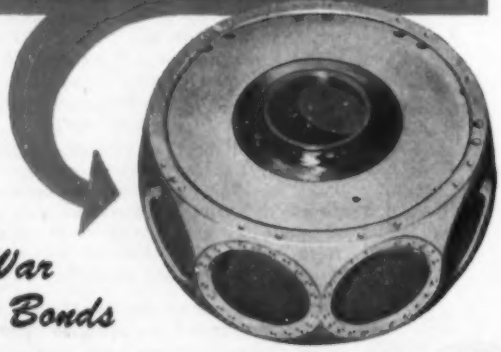
BARBER-COLMAN
UNGROUND FORMED
MILLING CUTTERS

THIS B-C FORMED CUTTER...

FORMS THE INSIDE OF THESE FORGINGS . . .



AS ONE OF THE FIRST STEPS IN PRODUCING THIS . . .



33% LONGER TOOL LIFE ON AIRCRAFT ENGINE CRANKCASE JOB

This cutter was designed with special clearances so it would wear evenly over the whole form, and eliminate chip congestion, which is one of the main reasons why it gives 24 pieces per grind instead of the 16 formerly obtained. This is a "rugged" job that shows up a cutter's real worth — a very tough steel forging (SAE 4140), a cutter speed of 45 r.p.m. and a feed of 1.6" per minute, stock removal of ⅛" to ¼" with more where it goes through the bosses to form the joining lugs, and the cutter has to cut on three sides, top, bottom, and O. D. Fairly smooth finish and close accuracy is required. Note that this is an UNGROUND cutter.

MACHINE SET-UP DATA

Cut is approximately 3" deep and 57" around. Stock removed, ⅛" to ¼". Feed 1.608" per min. Speed 45 r. p. m. Floor-to-floor time 43 min. Cutter gives 24 pieces per sharpening, with .012" to .020" removed each sharpening. Operated in coolant bath to ⅓ depth.

Buy War Bonds

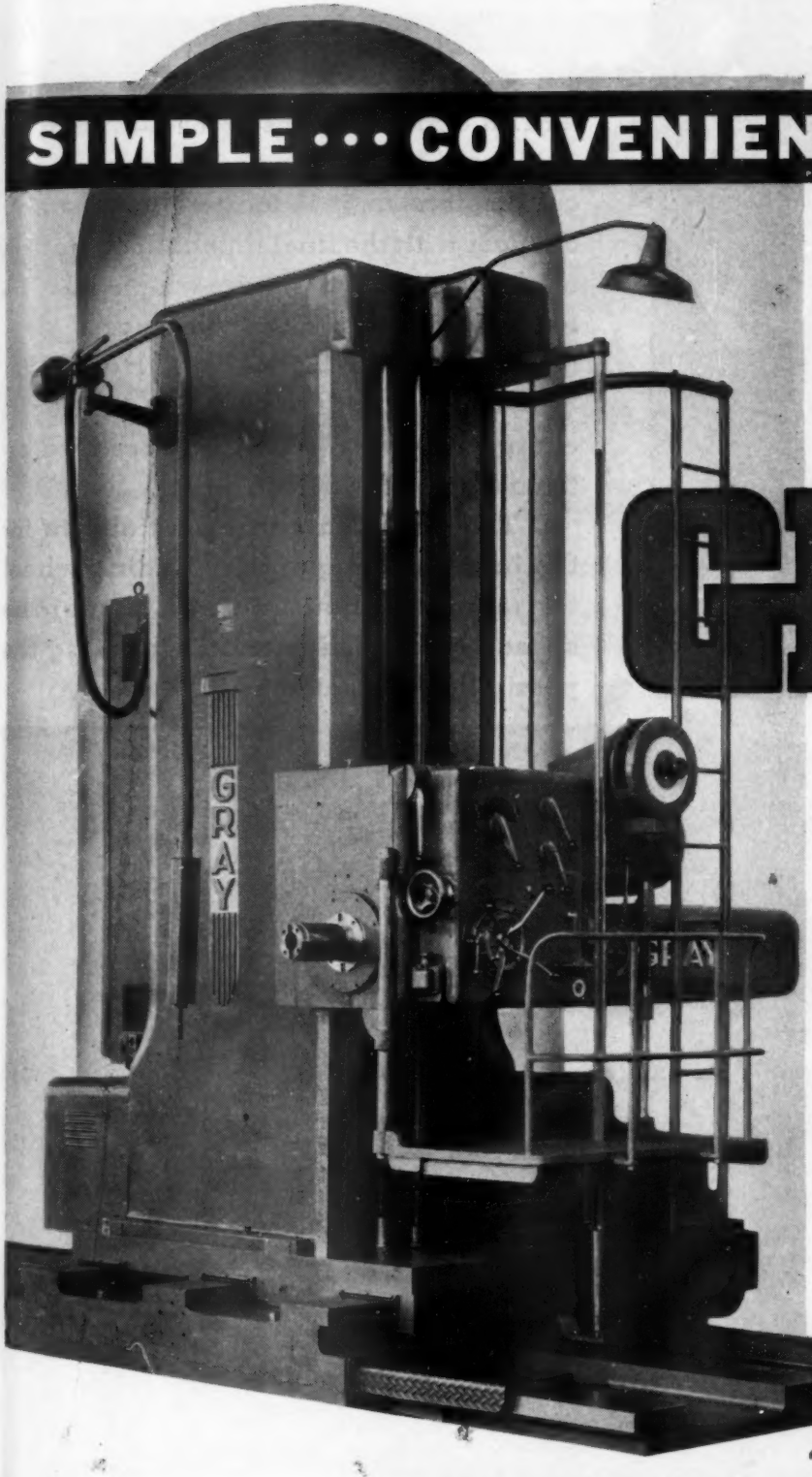
BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

SIMPLE · · · CONVENIENT CONTROL



A FEATURE OF THE HORIZONTAL BORING, DRILLING, AND MILLING MACHINE BY

GRAY

● Convenience — speed — and safety of operation have been greatly increased by simplification of the controls and by reducing the number of push buttons and control levers.

Directional selector levers are used for the spindle feed — the head — and column movements. Push buttons on the pendant switch, control the feed and rapid traverse movements of the spindle — head — and column. Micro-jog push button control is also included on the pendant switch. The operator has complete control of all operations from his normal working position.

WRITE

for full descriptive bulletins for complete construction and operation information.

●

THE G. A. GRAY COMPANY
Cincinnati Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Borir. Machines.

where accuracy really counts

AFTER expending costly machining time in the production of master rods for aircraft motors . . . it is too late to take any chances with the final finishing operation of grinding the joint faces which must be held to extremely close tolerances.

This HILL "Open Side" Horizontal Spindle Hydraulic Surface Grinder is equipped with an auxiliary cross feed attachment with calibrated dial.

The precision attachment allows for the instant setting of the grinding wheel to fractional thousandths . . . thereby speeding production and eliminating the possibility of manual error.

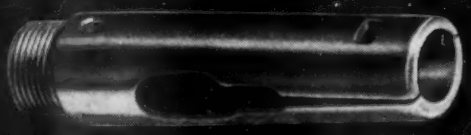
Unretouched photo of 18"x 18"x 60" HILL "Open Side" Horizontal Spindle Hydraulic Surface Grinder.

ALSO BUILT IN VERTICAL SPINDLE DESIGN

The HILL ACME Co.

6400 BREAKWATER AVE • CLEVELAND, OHIO

HARDINGE



Style "B"
Master Feed Fingers and Replaceable Pads

Save Material

The illustrations graphically show the material saved when a HARDINGE Style "B" Master Feed Finger and interchangeable Pads are used instead of conventional solid feed fingers.

Although this saving has been going on in screw machine departments using Style "B" since 1928, it is now more important than ever before as the economy not only saves money for you, but also conserves steel which is of vital importance today.

This saving is apparent to you. The many other advantages of using HARDINGE Style "B" Master Feed Fingers with either steel, bronze or nickel cast iron pads will be immediately appreciated when you put them into use. Learn these advantages by asking for your copy of the bulletin illustrated below.

ASK FOR THIS BULLETIN

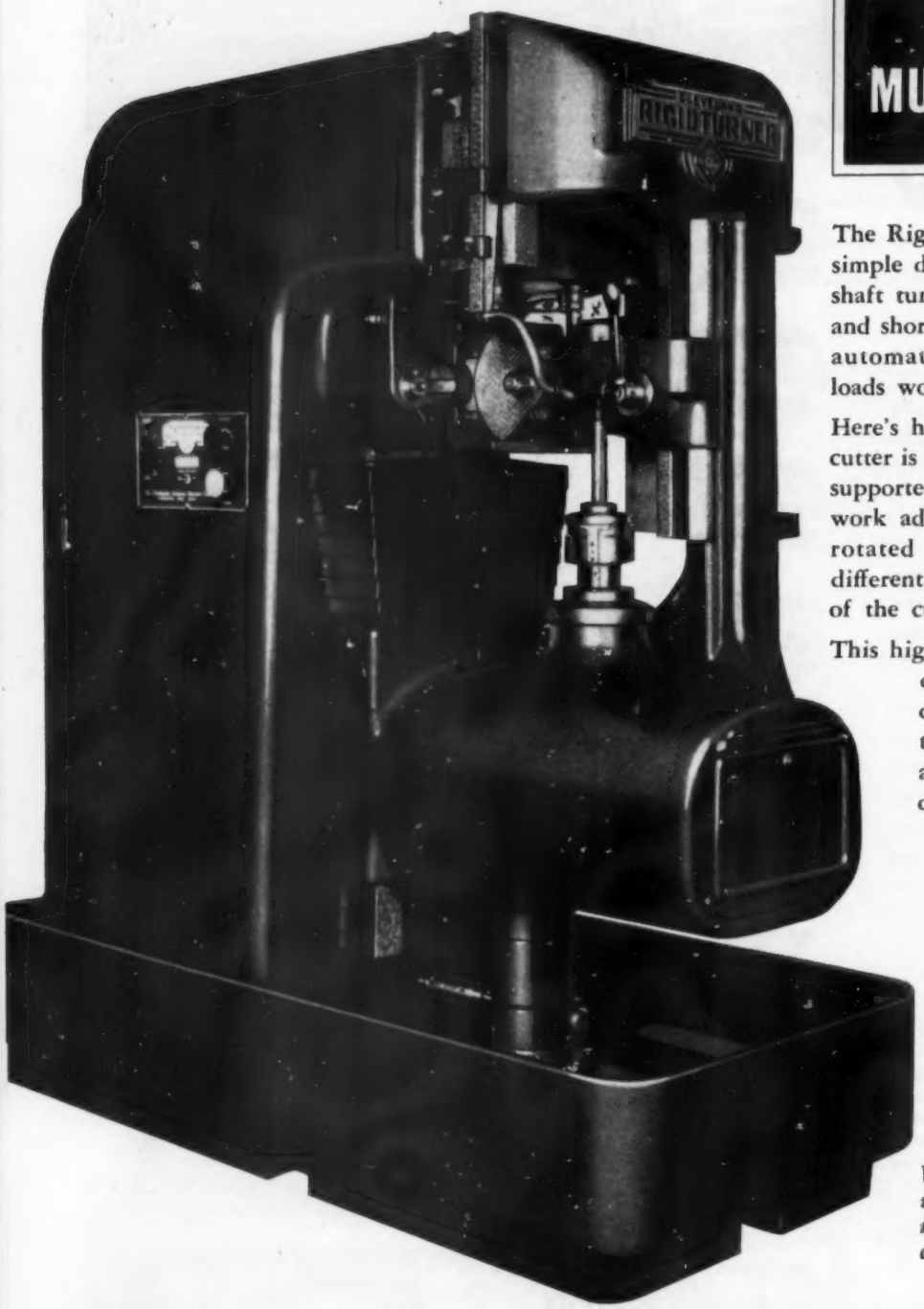
Every screw machine department should have the complete information given in this bulletin. Available to purchasing agents, superintendents, foremen, engineers, set-up men and operators in organizations which have a screw machine department.

HARDINGE BROTHERS, Inc.
ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

The Rigidturner

A PROVED METHOD OF TURNING MULTIPLE DIAMETERS

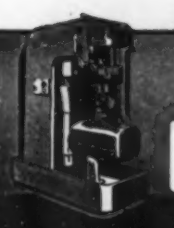


The Rigidturner is a sturdy machine of simple design—adaptable to any type of shaft turning. Economical on both long and short runs due to ease of set-up and automatic operation—operator merely loads work and presses button.

Here's how it works—a disc type form cutter is mounted on the cutter arbor and supported by an outboard support. The work advances by the cutter which is rotated in timed relation to produce different diameters. One complete pass of the cutter completes an operation.

This high production machine has been developed for turning multiple diameter work in large quantities in the minimum of time and maintains close tolerance duplication.

Write for booklet today—it tells what the Rigidturner is—how it works—how it will cut your costs for turning multiple diameter work.



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

FASTEN ALUMINUM WITH ALUMINUM

Send for this new catalog . . . it's Free

Standard aluminum fastening devices, manufactured by Alcoa in various alloys of Alcoa Aluminum, meet the rigid requirements of the many industries assembling aluminum products. A high degree of precision is maintained. They contribute security, light weight, ease of handling, fine appearance and corrosion resistance.

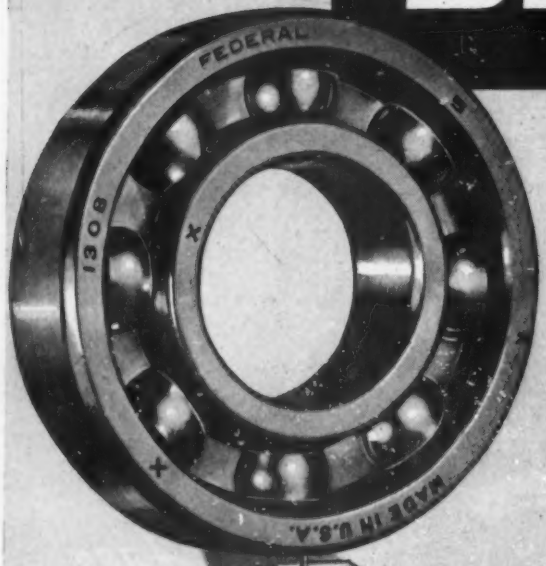
Strong aluminum alloy screws, bolts, nuts and rivets make dependable fastening devices; witness the aircraft using millions of them daily. Include these items in your designs and gain the security which comes from fastening aluminum with aluminum, and the economies obtained by standardization.

Alcoa *standard* screw products are now available in all needed types, sizes and finishes. "Stock" items are carried in warehouse stocks, strategically located throughout the country, by all authorized Alcoa distributors. Where special parts are required, manufacturing facilities are available for producing them.

For a copy of this new catalog, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

FEDERAL BEARINGS



In plants and factories throughout the nation . . . FEDERAL BEARINGS aid war production . . . on the battlefront, they serve the armed forces of the U. S. . . . and when victory is won these fine ball bearings will again be available for every peacetime purpose.

TRADE MARK

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building

Chicago: 902 S. Wabash Ave. • Los Angeles: 5410 Wilshire Blvd.

CRANKCASE PLATES

for one of the 9,000

October 1943 saw 9,000 planes roll from America's production lines. Proof that in nearly every operation of the thousands involved the airplane engine builders have invariably now settled upon Bullard machines for the job.

Bullard Vertical Turret Lathes with two heads working together provide that extra speed so necessary in today's production. Because of its rigid vertical structure it is trusted with work involving many of today's close tolerances.

After the war planes of the United Nations have done their work, and victory is ours, the adaptability of the V.T.L.s will be a "quick asset" held by their owners, as they face the demands of the world of tomorrow.

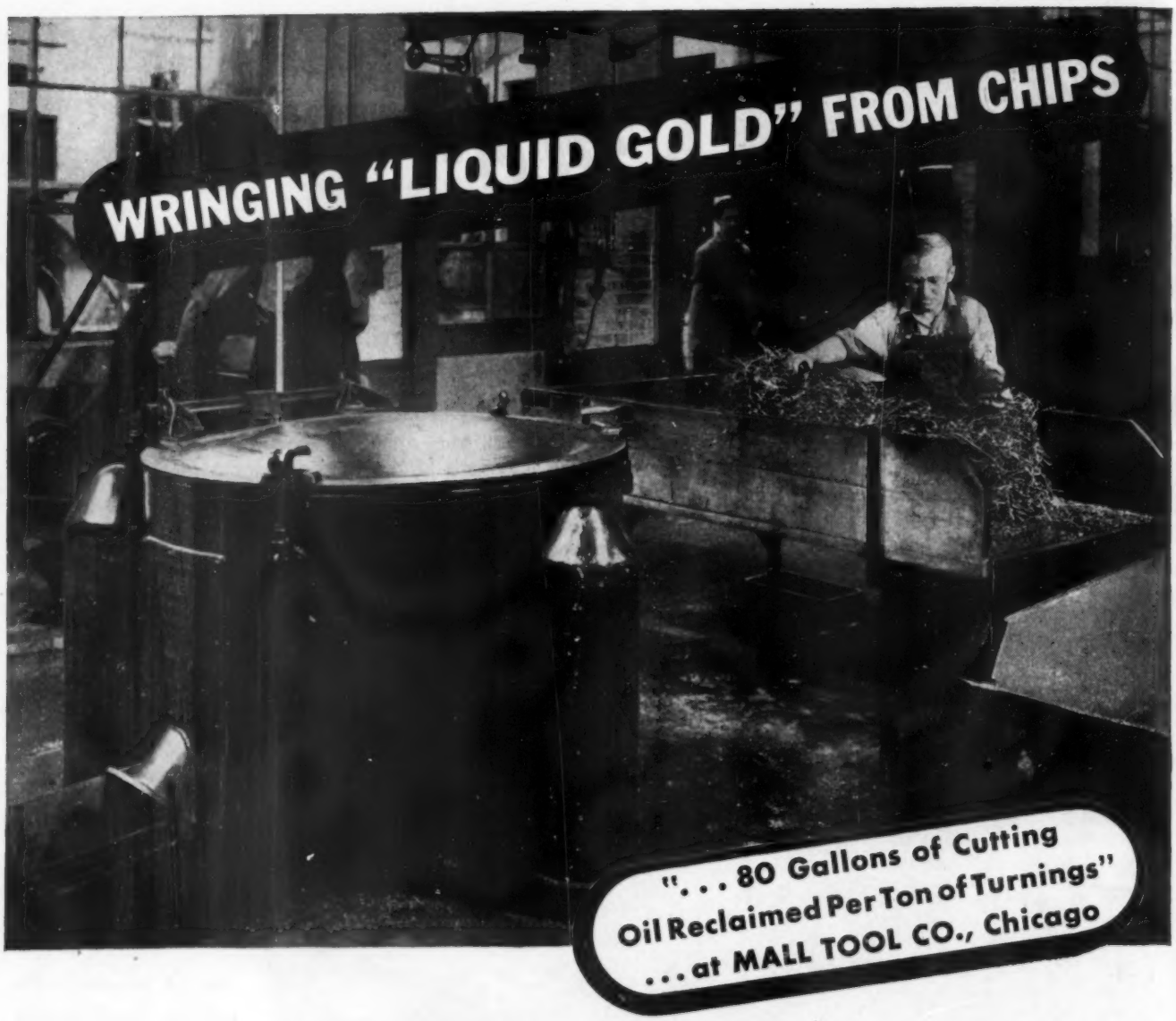
Just 15 minutes is the time for rough turning and chamfering outside and inside radii on these counterweight plates for airplane engine crankcase on this Vertical Turret Lathe. This machine is in the plant of a famous California builder of engines.

Spiral Drive Vertical Turret Lathes are built in 24", 36", 42" and 54" table sizes. Also Cut Master Vertical Turret Lathes in 30", 36", 42", 54", 64", and 74" sizes with two or three heads.

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



TOLHURST CHIP WRINGERS—recover up to 98.6% of valuable cutting oil from metal chips through the application of *centrifugal force only*. At this busy Chicago plant the saving with a Tolhurst is 80 gallons per ton of screw machine turnings.

TOLHURST USERS HAVE NOTED

REDUCED TOOL WEAR—Tool room records show as much as 50% reduction in tool wear run with Tolhurst equipment installed. A plentiful supply of fresh reclaimed oil encourages a more conscientious use of cutting oil . . . hence longer tool life.

INCREASED CHIP VALUE—Dry chips, ready for remelt, bring higher scrap prices. Machineable pieces of metal, otherwise scrapped, are also retrieved as part of the routine operation.

CLEANER PLANT—Frequent collection and processing of chips results in cleaner floors, reducing of fire and personal accidents.

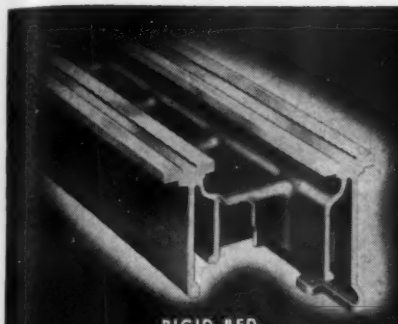
SIMPLE OPERATION—Unskilled help can efficiently operate the simple routine of Tolhurst Chip Wringers—8 to 10 loads per hour.

Save Cutting Oil—Save Metal—Write for details and prices!

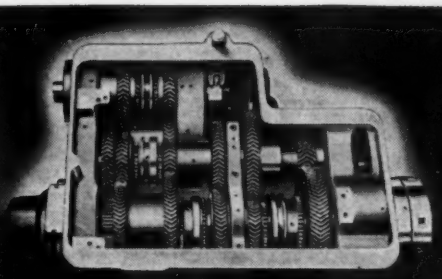
TOLHURST CHIP WRINGERS

TOLHURST CENTRIFUGAL DIVISION • *American Machine and Metals, Inc., East Moline, Illinois*

"Since 1852—CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"



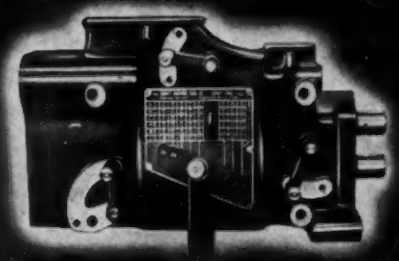
RIGID BED CONSTRUCTION



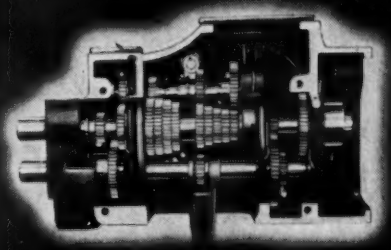
CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

40TH ANNIVERSARY



FRONT VIEW OF GEAR BOX



REAR VIEW OF GEAR BOX

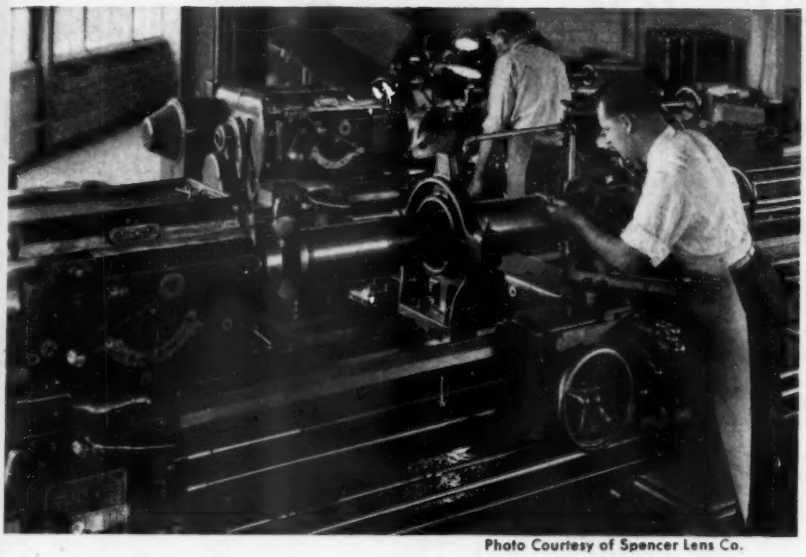
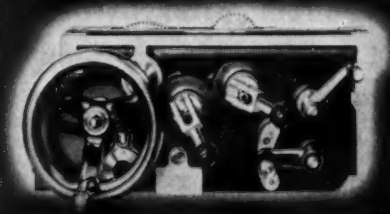
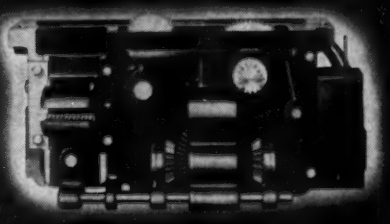


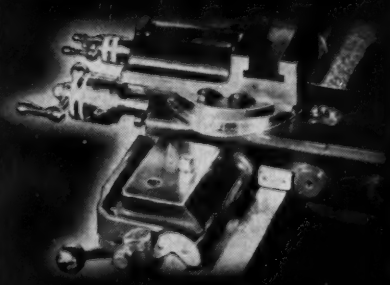
Photo Courtesy of Spencer Lens Co.



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST

For close tolerance work

SIDNEY LATHES

The versatility of Sidney Lathes is demonstrated here where two of the battery of Sidney lathes shown are handling distinctly different jobs—quickly—accurately—easily.

The sturdy bed construction—the perfect alignment of the component parts—the smooth flow of power from the continuous tooth Herringbone Geared Headstock assure continued accuracy and fine finish on all jobs.

When your work calls for extremely close tolerances—for high speeds and heavy feeds—for smooth dependable finish—put it on a Sidney Lathe.

Full descriptive bulletins on all sizes immediately available.

SIDNEY

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head — at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW Type Machine

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

Many machines show 75% greater average daily productivity.

Write for Circular

DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE 20, (DETROIT), MICHIGAN

Our Catalog No. 102 presents engineering data which may be helpful to you in selecting the proper gage or carbide tool to your purpose.

SEND FOR CATALOG No. 102

METRO

TOOL AND GAGE CO.

4240 PETERSON AVE.
CHICAGO, 30, ILL.

ARMSTRONG

Even the new apprentice starts with a "world" of experience

Even the "greenest" operator starts with a world of experience if you furnish him with the correct ARMSTRONG TOOL HOLDERS. His cutter will always be at the most efficient cutting angle, his "tool approach," the most convenient and accurate. His tool will have the requisite rigidity or resiliency—if it's a thread-cutting operation the cutter form will be exact and accurate, and he will be able to operate at speeds and feeds unheard of a generation ago.

Used in over 96% of the machine shops and tool rooms of America, in all parts of the world wherever metal is machined, ARMSTRONG TOOL HOLDERS embody the world's experience in cutting tool design, developed, refined and proven by ARMSTRONG's 50 years of specialization in cutting tools for lathes, planers, slotters and shapers.

Let this world experience increase your efficiency, use the correct ARMSTRONG TOOL HOLDERS for each operation — they are stocked by your local mill supply house.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Sales Office:
199 Lafayette St., N.Y.

ARMSTRONG TOOL HOLDERS Are Used In Over 96% of the Machine Shops and Tool Rooms

Preselecting the Speed

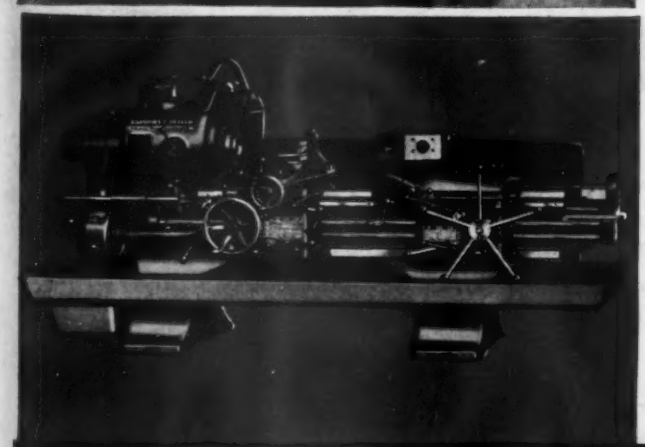
FOR THE NEXT CUT

Means not only more parts produced at the end of the day. It also means that the operator feels less fatigued and more able to enjoy his hours of leisure.

Merely turn the drum type dial while the machine is working. Select either the spindle speed in revolutions per minute or the cutting speed in feet per minute for the next cut. Then when the feed drops out change without delay to the new speed.

This and many other outstanding features of the BARDONS & OLIVER NO. 21 SADDLE TYPE UNIVERSAL TURRET LATHE are described in the new catalog.

Write for your copy today.



BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

The NEWTON Unit Head Box Type MILLING MACHINE

making economy possible on *any* BIG JOB

No one knows at this moment when or where the turn will come from production at any cost to production at lowest cost. But when V-day does arrive, NEWTON MILLING MACHINES with "UNIBOX" HEADS will be ready to meet post-war demands, because they can be quickly converted to any specific job.

The 84" machine shown here is equipped with 4-"UNIBOX" Milling heads. It will pay you to explore the production possibilities of these machines for your present or future work.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

WHEN YOU NEED

D-C Motor Controls

CONSULT WESTINGHOUSE BUYING DATA (NEW CATALOG 7000)

With the new Westinghouse Buying Data, you can select and purchase the proper motor control in half the time.

Data, as presented, is striking in its newness. It's easier to read, easier to understand, and easier to use than any published previously by any manufacturer.

Chances are—if you are a buyer of motors and controls—that you have already received a copy of this new Catalog 7000 by mail. However, if you have not received your copy, write, wire or phone your nearest Westinghouse district office. (Requests will be filled through district offices only—no mailing from Westinghouse headquarters at East Pittsburgh.) J-21309

Westinghouse

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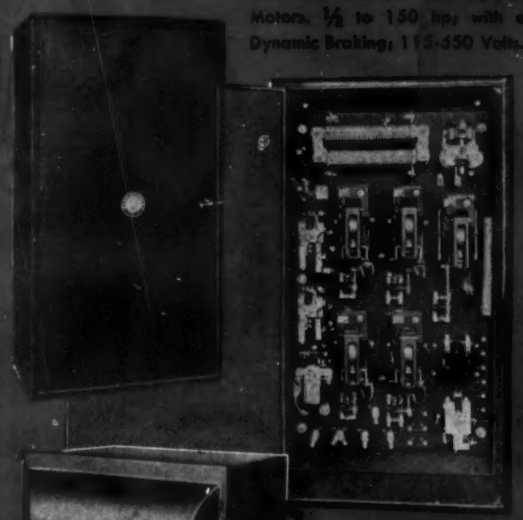
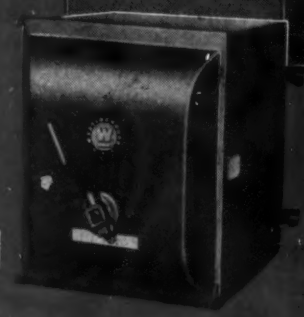
Motor Control



Heavy-Duty Reversing D-C Magnetic Timestarter for Constant and Adjustable Speed Motors. ½ to 150 hp; with or without Dynamic Braking; 115-550 Volts.



Manual Nonreversing Starting and Speed Regulating Rheostat for ¼ to 150 hp Applications. 32-550 Volts D-C.

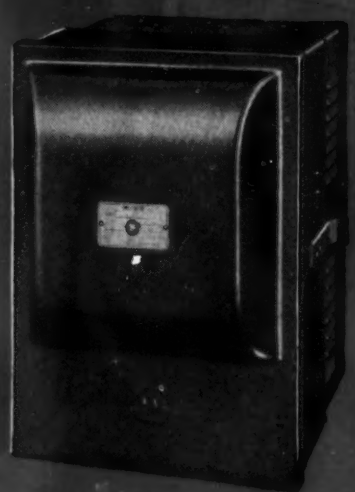
Reversing Drum-Controller for Crane and Hoist Service, 1 to 50 hp; 115, 230, 550 Volts D-C.

Nonreversing "De-ion" Linestarter for Compound-Wound D-C Motors. 1½ and 2 hp; 115 and 230 Volts.

Heavy-Duty Nonreversing D-C Magnetic Timestarter for Constant and Adjustable Speed Motors, with or without Dynamic Braking. ½-150 hp; 115-550 Volts.

Reversing "De-ion" Linestarter for Compound-Wound D-C Motors. 1½ and 2 hp; 115 and 230 Volts.

D-C General Purpose Nonreversing Magnetic Timestarter for Time Limit Acceleration. ½-10 hp; 115 and 230 Volts.



VULCAN CAN DESIGN YOUR TOOLS

Comparator Fixture used for checking threads on one-piece crank and also three-piece crank assembled and disassembled. Designed and built by Vulcan Tool Co.

Ask for this brochure which explains Vulcan's experience and service facilities.

VULCAN TOOL Co.
DAYTON OHIO

ENGINEERING • DESIGNING • BUILDING • GAUGES • TOOLS • DIES • JIGS • SPECIAL MACHINERY

Van Keuren

THREAD MEASURING WIRES
A *Standard* FOR ACCURACY IN
LEADING WAR PRODUCTION PLANTS

The wire system of thread and gear measurement is easy to use and gives exceptionally accurate results. Our Manual of precision measuring tools gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable handbook!

Leading arsenals and war production plants know the importance of accuracy in thread and gear measuring. That is why so many of these plants are using Van Keuren Measuring Wires as standard equipment for measuring thread gages, taps, worms, splines and spur gears. Made in any size from 1.5708" down to .002" in diameter, they are guaranteed to be within .00002" for roundness and straightness and within plus or minus .000025" for size. Special sizes can be made to your specifications as to size and tolerances. Easy to use, Van Keuren Wires bring ultimate accuracy to your operations. Write for full details.

Van Keuren

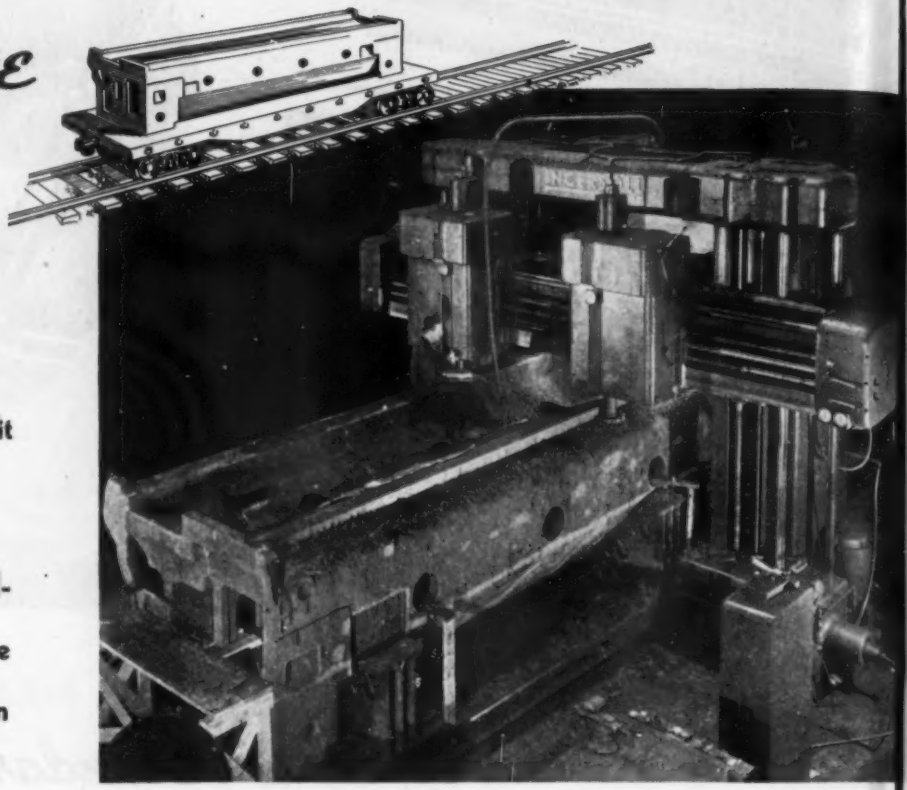
25th YEAR

CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Sine Triangles

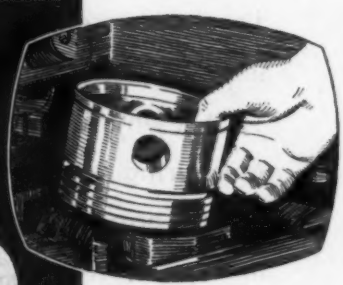
INGERSOLL MACHINES

for parts large enough to cover a flatcar . . .



Ingersoll machines are built to fit their jobs.

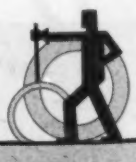
This four-head adjustable rail milling machine was made for large work such as the thirty-five ton casting shown on the table.



. . . small enough to hold in your hand!

This is a single purpose milling machine . . . built for one operation . . . the high production of aluminum aircraft pistons. It mills the relief on one hundred and fifty pistons per hour.

Booklets illustrating and describing other special Ingersoll Milling, Drilling or Boring Machines, built for specific operations or particular types of work, will be sent upon request.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

Yes, Men Make Motors!

NO MACHINE KNOWN can duplicate the skill of Sam Meister, left, of Allis-Chalmers Norwood Works.

Holding an acetylene torch in his right hand, a silver alloy rod in his left, Sam silver-brazes end connections of Allis-Chalmers' "Indestructible Rotor."

Round and round the connections he works — expertly flowing in molten alloy to form a joined structure that can withstand as much heat as though it were a single die-casting.

No machine can do that job — and no machine can fully test how well it is done.

There's only one test . . . wait 5, 10, 15 years and *see.*

And that's the test in which Allis-Chalmers motors have proved over the years that they're *great* motors. That's why you hear it said so often: *"You can depend on Allis-Chalmers Motors!"*

• • •

YES, HUNDREDS of Allis-Chalmers men—craftsmen like Sam Meister — know they have a big personal stake in every Allis-Chalmers motor. When they build a great motor for you, they're making a *friend* . . . and they know that's something no company and its workers can have too many of.

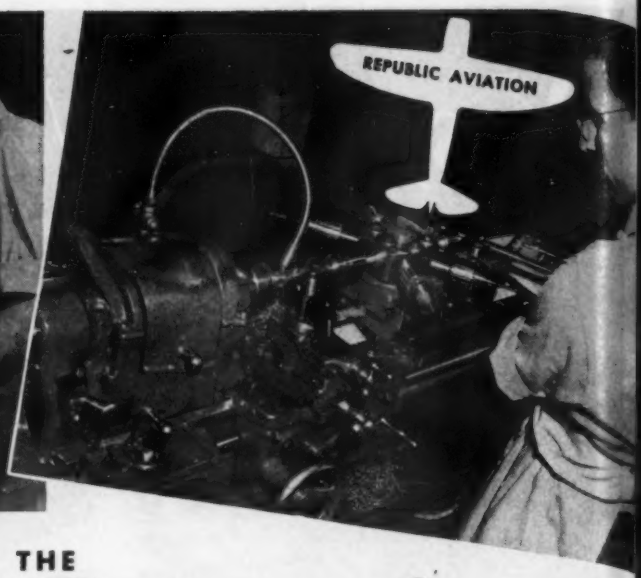
Next time *you* need great motors contact our district office. Or write direct to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 1730

AC — VICTORY — PEACE

♪ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, EWT.*

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS



IN THE

Aircraft Industries

SOUTH BEND LATHES have long been popular for precision manufacturing operations and fine tool work in the aircraft industry. Today, in the greatest plane production schedule in history, these modern lathes are more than keeping their traditions for dependable precision and exacting tolerances. Providing lathes to most of the aircraft industry is one of our many important war assignments.

TRAINING HELPS

South Bend training helps—books, sound films, wall charts, and booklets on the care and operation of engine lathes and toolroom lathes—are available for facilitating the training of new lathe operators. Write for a copy of Bulletin 21-C.

BUY WAR BONDS NOW • • • SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

JEWELS For Sale
A recent visitor stood wide-eyed amid hundreds of racks of gleaming small tools in our final inspection department. He said, "It is difficult to realize that these thousands of sparkling pieces of metal are tools — they look more like jewels.
Small wonder he felt that way. For each one is a jewel of precision workmanship, top-notch metallurgy and perfection of finish. That is the way we've made P&W cutting tools for more than 84 years. Mechanics in every civilized country have come to know and like P&W Small Tools for their quality, long life, and dependable performance. If you use small tools, try these "jewels." They can increase your production and reduce your small tool costs. For details, get in touch with the nearest P&W branch office, listed below:
Shown here are P&W Expansion Reamers—one of many items in the complete line of Pratt & Whitney quality small tools.
Sales Offices and Agencies—BIRMINGHAM BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT
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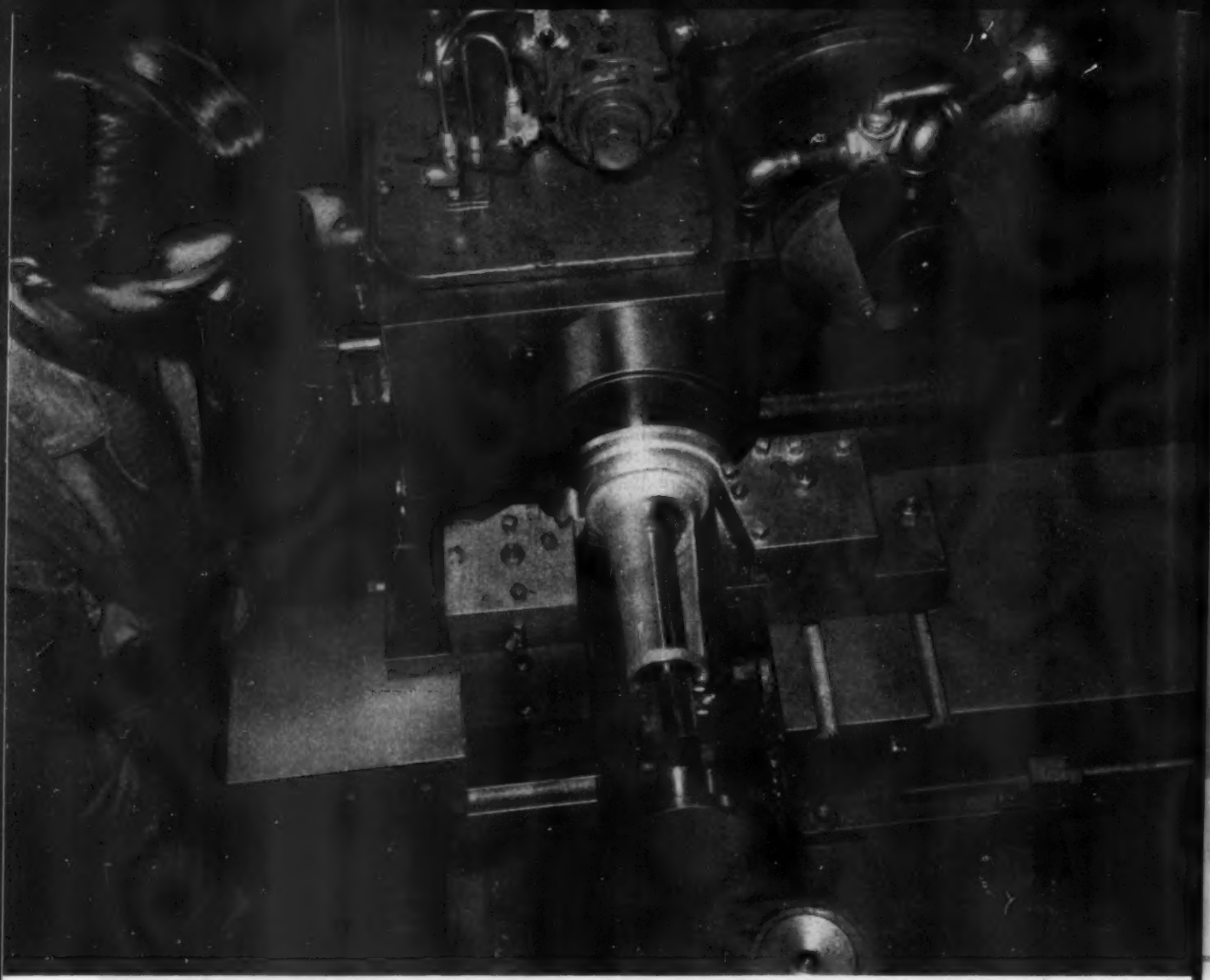


DOUBLE DUTY

WITH THE GISHOLT HYDRAULIC AUTOMATIC LATHE

ACTUALLY "double duty" is ultra-conservative for the production ability of this automatic lathe. For it can out-produce two, three, or even four manually operated machines wherever parts are to be turned out in large quantities.

What's more, its operation is so simple that one man, or woman, can tend two or three machines at a time. With but one small lever to control a whole cycle of operations, the training problem is practically eliminated. It's designed to handle a wide variety of between-centers and chucking work with high speed multiple cutting and extreme accuracy. If you can use this kind of production—to save man-power and cut costs—now and in the post-war period—ask for facts about the Gisholt Hydraulic Automatic Lathe.

GISHOLT MACHINE COMPANY
1201 East Washington Ave. • Madison 3, Wis.

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINE

Where reverses bring success...

Rapid reversals for various motions on modern high-speed machine tools provide the opportunity to decrease machining times. Multiplied by the number of reversals per work cycle and the number of cycles per day, these operations add up to a sizeable number of man-hours. In a postwar competitive market, the savings on time can mean the difference between success and failure.

Regardless of the application—lathe—drilling and tapping machine—multiple spindle drill—there is a Westinghouse A-C reversing drive to fit the job. Successful installations, proved in use, include lathe drives capable of reversing 15 to 25 times a [illegible]te and drills, 14 to 60 times a minute.

For example, one machine tool builder uses a Westinghouse multiple-speed motor rated at 3/2/1-1/2/1 hp, 3600/1800/1200/600 rpm, and providing 6, 14, 24 and 60 reversals per minute for these speeds, respectively.

The determination of the proper rating and size of motor for a specific machine tool application is but one of the many problems of machinery electrification for which Westinghouse can supply you the proper answer. This ability to provide simple electrical solutions to complex mechanical problems is yours for the asking. Just call your nearest local office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-94619

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

THE MACHINE IN MACHINE TOOLS

Introducing the KENNAMILL

The amazingly simplified inserted-blade step-cutter that makes high-speed carbide face-milling of steel possible in every shop!

Partially completed cut illustrating method of flycutting in steps—note bright, smooth finish obtained.

A sensational Kennametal achievement—the KENNAMILL—can give new life to your milling machines . . . adapting them for the high speed milling of steel that is inherent in modern, negative rake carbide cutters. At the same time, the Kennamill can improve the quality of your work by producing finished surfaces that are exceptionally smooth and accurate.

Kennamills are inserted-blade cutters, available in four sizes with taper shanks to fit standard spindles, as listed below. All sizes use the same ⅝" square, 10° negative back rake Kennametal-tipped blade (Cat. No. 39M40). Two sets of blades are supplied with each cutter head.

The low initial cost of Kennamills is combined with economy of blade maintenance. No expensive grinding equipment is needed—the blades are easily removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary since each blade cuts an independent path.

The use of Kennamills assures optimum machine performance. The sturdiness of the cutter body, plus distribution of the work over the keen-cutting Kennametal-tipped blades, minimizes vibration and chatter, smoothes out the load, and fully utilizes available horsepower, with feeds up to 21" per minute.

Kennamills are available for immediate delivery. They are stocked at our factory, and at Kennametal offices in Atlanta, Chicago, Detroit, Houston, Los Angeles, Philadelphia, New York, and San Francisco. Get in tune with the fast-moving tempo of carbide steel milling—order Kennamills today.

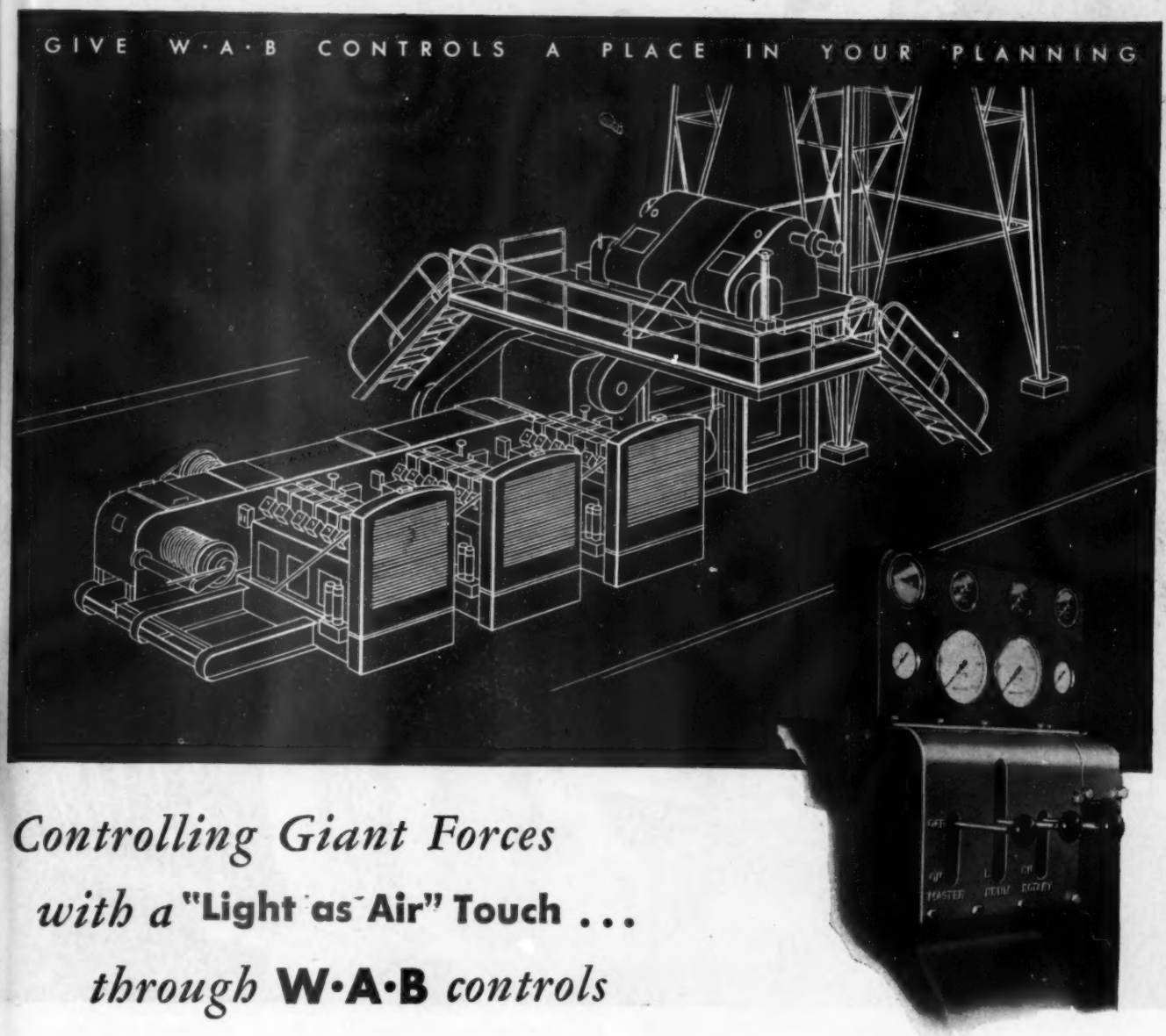
PRICES OF KENNAMILLS
(Complete, with 2 sets of No. 39M40 Kennametal-tipped blades)

Size	Fits Spindle	No. of Blades in Cutter	Price Each
2"-40	# 40	3	$31.91
2"-50	# 50	3	35.41
3"-40	# 40	4	39.99
3"-50	# 50	4	41.22
4"-50	# 50	4	43.04
5"-50	# 50	4	44.85

Extra Blades (No. 39M40) each $1.83
Templates—for regrinding blades—each $1.75

KENNAMETAL
CEMENTED CARBIDES

KENNAMETAL *Inc.*, 103 LLOYD AVE., LATROBE, PA.



Controlling Giant Forces with a "Light as Air" Touch . . . *through* W·A·B *controls*

There are a lot of remote control applications—you may have some in your own plant or product—where tremendous forces must be governed, in a complex series of operations. Jobs like these are "naturals" for W·A·B controls. Oil drilling equipment provides a good example.

Rigs must have the sheer muscle to handle strings of casing weighing tons . . . and yet provide the delicate and precise control necessary for various drilling operations. The engines in the power unit must be ready to work individually, or in combination.

W·A·B Controls permit all of these complex functions to be governed from one compact control stand. A finger touch is all that is necessary to initiate and command the most powerful operating forces. The entire cycle of operation of individual engines can be covered by positioning the handles, and in compound operation loads can be readily balanced. Simple and positive interlocks prevent the setting up of opposing actions, and the sensitive response shields equipment from destructive shocks.

In your thinking about improvements in your products or your production methods, don't overlook the contribution that W·A·B controls can make. Give them a place in your planning.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

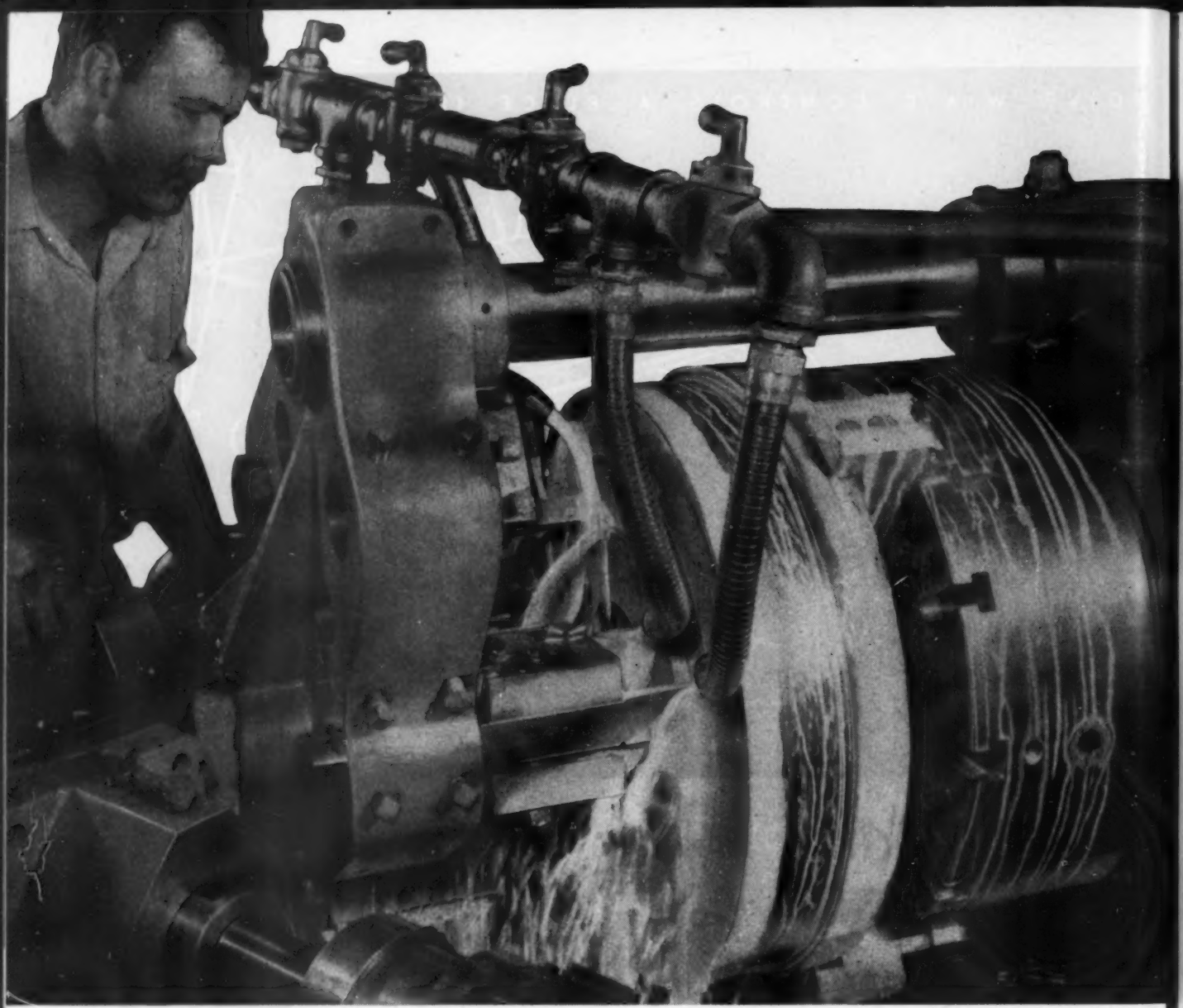
General Offices: Wilmerding, Pa.

75 Years of Pneumatic Control Experience

W·A·B

Pneumatic . . . Pneumatic-Electric . . . Pneumatic-Hydraulic

control systems



CUTTING POWER . . . *to help win the war . . . and the peace!*

YOU need never worry about the ability of your Gisholt to deliver the power for heavy cuts. There's all the power you'll ever need—and more—for every practical purpose. Feeds and speeds are limited only by what your cutting tools can withstand.

Gisholt's large multiple disc clutches, together with hardened alloy steel gears, turn on husky shafts in anti-friction bearings. They enable Gisholt's sturdy spindle to transmit tremendous power without deflection or chatter.

Combined with Gisholt power are the speed and accuracy that keep production at war-winning levels. It adds up to the *modern* cutting power that will help you cut costs in the postwar era, too.

GISHOLT MACHINE COMPANY

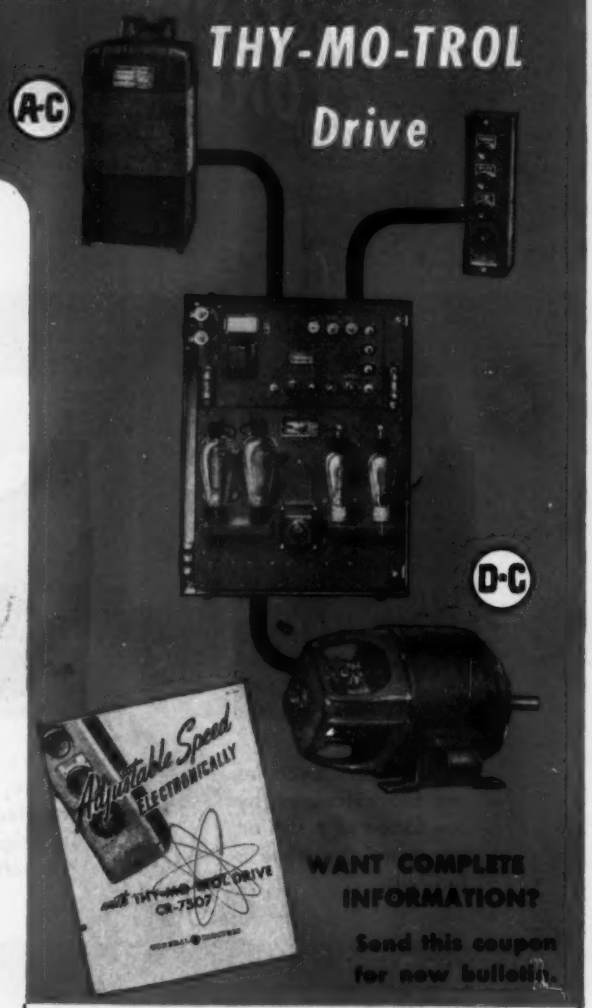
1201 *East Washington Avenue • Madison 3, Wisconsin*

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

CONSTANT SPEED EVEN WITH CHANGING LOADS

--ANOTHER Advantage of THY-MO-TROL Drive



What it means to machine users

MAINTAINED PRODUCTION because the speed of the motor does not fall off appreciably as the load on the machine increases.

IMPROVED QUALITY OF WORK because Thy-mo-trol drive provides the *correct operating speed*, and holds it.

NEED FOR GEAR CHANGING OFTEN ELIMINATED because Thy-mo-trol drive makes possible a wide speed range—ratios of 100:1 or greater can be provided.

ACCURATE SPEED CONTROL. Speed is held constant at the level the operator selects for each operation needed.

Standard Thy-mo-trol drives hold speed very closely, even though the load varies from no load to full load, because the electronic circuits automatically compensate for the voltage drop within the motor (which varies according to the load). For example, if the compensation adjustment is set for flat speed regulation at 10 per cent of basic speed, the regulation will be within 2 per cent when the drive is operated at basic speed (assuming constant motor temperatures).

When regulation better than that provided by the standard Thy-mo-trol drive is required, the addition of a tachometer generator affords speed regulation within one-half of 1 per cent.

A COMPLETE DRIVE. Thy-mo-trol drive takes a-c power from your supply line and, through its d-c motor, delivers torque to your load over a wide range of speeds. Starts, accelerates, controls speed, stops by dynamic braking, and reverses the motor—all from a single control station.

Standard drives can be obtained in ratings from 1/8 to 15 hp—higher or lower if needed.

HOW TO BUY THY-MO-TROL. Just give our local office complete information about your requirements—nature of the load, speed range, horsepower, etc. Then, our engineers will select just the right Thy-mo-trol drive components, to give you exactly the operating characteristics you want.

WANT COMPLETE INFORMATION?

Send this coupon for new bulletin.

General Electric Company, Section K668-14
Schenectady 5, N. Y.

Please send me a copy of Bulletin GEA-4025, which tells what Thy-mo-trol drive will do, what it has done, and how it works.

Name .....

Company .....

Address .....

.....

8900

BUY WAR BONDS

GENERAL ELECTRIC

How to determine proper hardness OF SUPERFINISH STONES

While selecting the grade or hardness of a superfinish stone for a given finishing operation the wisest course is to consult a representative of the stone manufacturer. MID-WEST, for instance, maintains a staff of experts to help you with your honing, superfinishing or grinding problems. When, as sometimes happens, that is not possible, here's a simple way to determine whether the stone you are using is of the proper hardness:

Study These Photographs

A

If the stone becomes too black (caused by oxydation of metal on the stone) the stone is *too hard.*

B

If the stone remains too clean, too close to its original color, it is *too soft.*

C

The stone best suited for your job will be a compromise between the two. It will show only a slight discoloration of its cutting surface.

MID-WEST ABRASIVE COMPANY

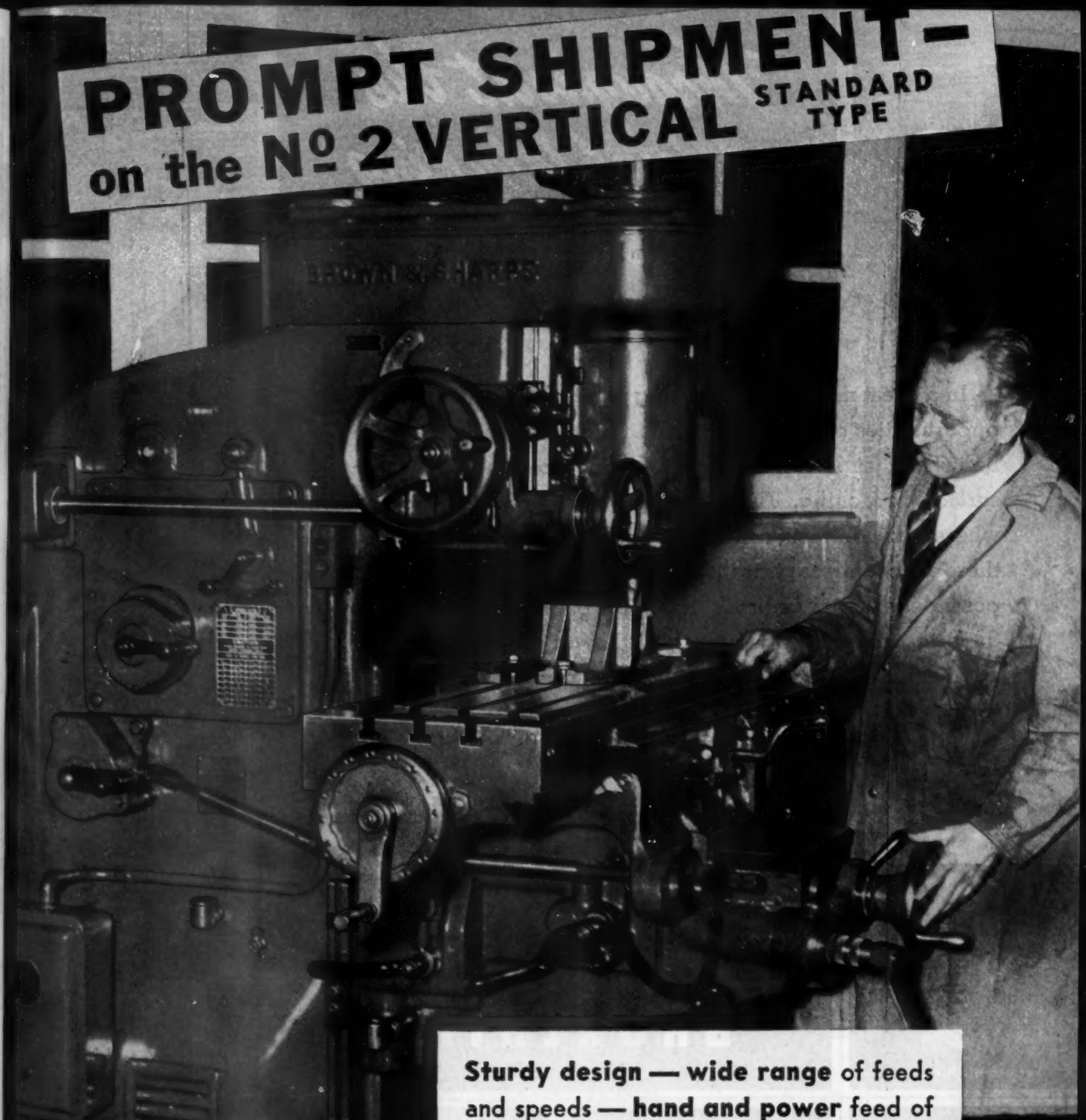
Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Avenue, Detroit 11, Mich.

Owosso, Mich.

Rochester, Pa.

PROMPT SHIPMENT— on the No 2 VERTICAL STANDARD TYPE



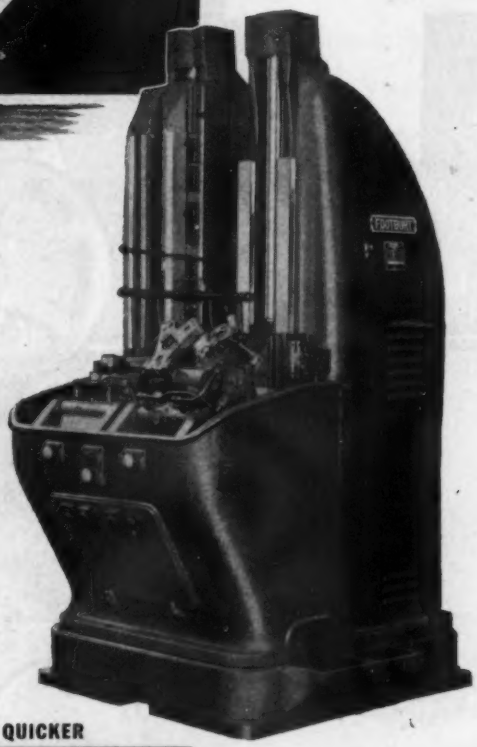
Sturdy design — wide range of feeds and speeds — **hand and power** feed of spindle head — **ample** throat distance — **all** of marked advantage for many types of end mill and face mill operations.

Investigate the No. 2 Vertical Milling Machine — Standard Type — for accurate toolroom set-ups and production milling.

BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U.S.A.

BROWN & SHARPE

Throughout the Metal Working Industry



★ In a great many metal working plants there are opportunities of machining parts faster, to closer limits and at lower tool maintenance cost thru surface broaching. There are still many places where war contracts can be speeded up now, and there are countless parts that will need the benefits possible with surface broaching in the competitive days to come. May we work with you on the application of surface broaching to your product?

THE FOOTE-BURT COMPANY • **Cleveland 8, Ohio**
Detroit Office: General Motors Building

STEP UP THE SCHEDULE ☆ WIN THE WAR QUICKER

FOOTBURT *Surface* BROACHING

Form Broaching

Slot Broaching (Indexed)

Castellation Broaching (Indexed)

Straddle Broaching

Rough Broaching Bevel Gears (Indexed)

Spur Gear Broaching (Indexed)

Hexagon Broaching (Indexed)

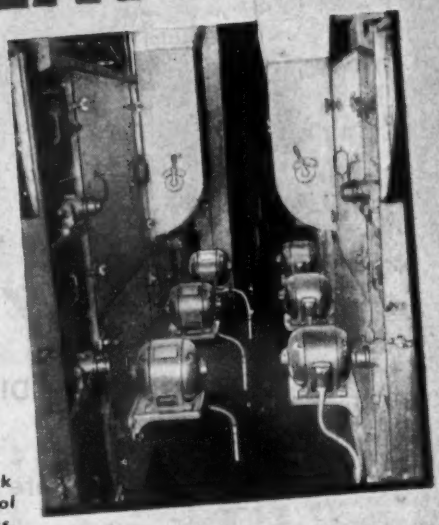
Form and Tongue Broaching

Serration Broaching

Casting Flash Broaching

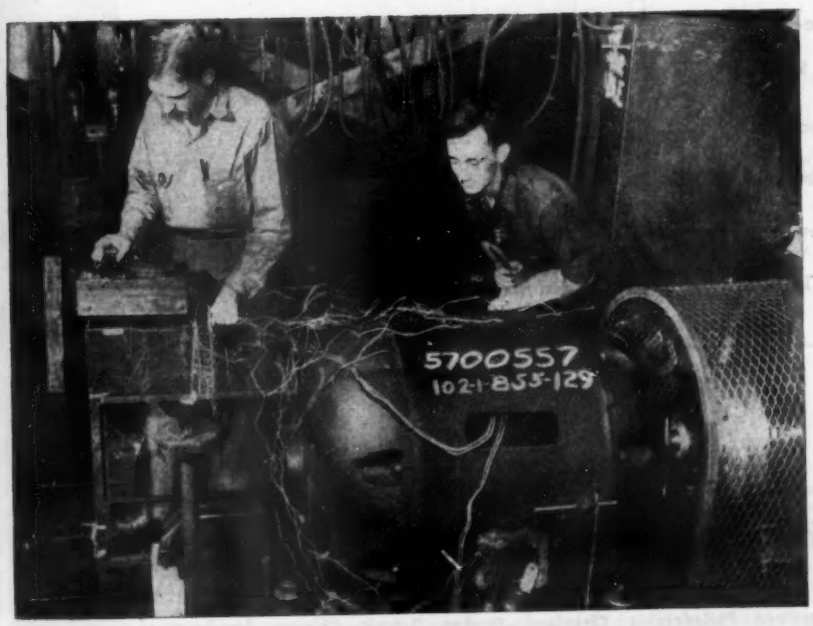
WHEN THE HEAT'S ON

Motor-driven machinery is often called upon to operate under conditions of extreme heat and humidity. For example, the motors on this wool-plant washer must operate in an air temperature of 100° F., with humidity higher than 80 per cent. Conditions like this would shorten the life of any motor lacking effective, performance-tested ventilation design. The double-end cooling system of the Tri-Clad motor helps offset the effects of high ambient temperatures common to heaters, dryers, and many ventilating-fan applications. In addition, motor windings of Formex wire (Class A insulation) are unusually long-lived under total temperatures (ambient plus rise) up to 194 F. For even higher temperatures, Class B insulation offers still greater protection.



G-E Tri-Clad motors applied to Sargent back washers at plant of the Southwell Wool Combing Company, No. Chelmsford, Mass.

Multi-Point Tests on TRI CLAD Motors Tell Temperature Conditions Inside and Out



Dozens of thermo-couples and thermometers at all vital points of this Tri-Clad motor reveal temperatures under a wide range of load conditions. First, tests like this helped to perfect the double-end ventilation design. Now regular tests of Tri-Clad motors taken off the production line verify previously established temperature-rise limits, and ability of insulation to stand up. Continued research along the same lines, including operation in enclosures which restrict air flow, points the way to further improvements in the future. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

TRI CLAD MOTORS

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

"Sterling" Stainless Steels

FOR DISCRIMINATING USERS

A complete line of wire, rod and bars

FIRTH-STERLING—a mill with a national reputation for consistently high quality Tool and Alloy Steels—is in a unique position to meet the special requirements of discriminating users of Stainless Steels. Since 1913, when FIRTH-STERLING made the first Stainless Steel produced in this country, we have specialized on made-to-order types for the most exacting specifications. Literature is available, giving complete details.

"Sterling" Stainless Steels Meet Special Requirements such as:

1. Closely Controlled Compositions.
2. Exacting Physical Requirements.
3. Surface Perfection in Various Finishes.
4. Precise Size and Shape Tolerances.

Ask For:

Bulletin No. SL-2009 on Types 420, 440-A, 440-B, and 440-C.

Bulletin No. SL-2010 on Types 403, 410, and 416.

Bulletin No. SL-2011 on Types 302, 303, and 304.

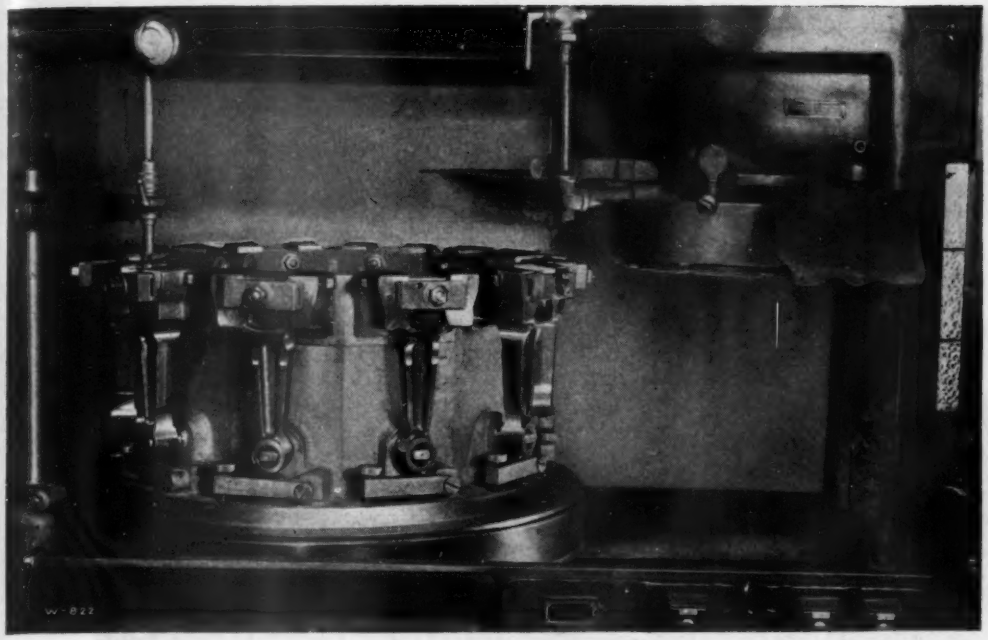
Bulletin No. SL-2018 on Cold Finished Stainless Steels.

Makers of Fine Stainless Steels Since 1913

Firth-Sterling

STEEL COMPANY

Offices: McKeesport, Pa. New York - Hartford - Philadelphia - Cleveland - Dayton - Detroit - Chicago - Los Angeles



The advantages of BLANCHARD *grinding*

★*Production*

★*Adaptability*

Fixture Saving

★*Operation Saving*

Material Saving

Fine Finish

★*Flatness*

Close Limits

★*Production* ★*Adaptability* ★*Operation Saving* ★*Flatness*

Grinding Nickel Steel Forgings

These are master rods for an 1830 H.P. radial engine.

Formerly they were milled and finish-ground, one at a time, at the rate of 15 to 20 minutes each.

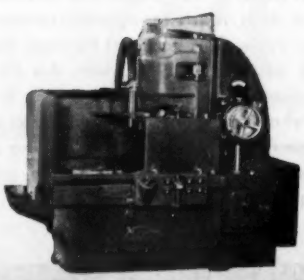
Now they are ground, 10 at a time in a special fixture, on the No. 18 Blanchard Surface Grinder which removes 3/8" of metal and turns them out at the rate of 4 minutes each.

This is only one of the many airplane engine parts that are being ground on the Blanchard, using magnetic, hand-clamping or automatic fixtures.

"Put it on the Blanchard"

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

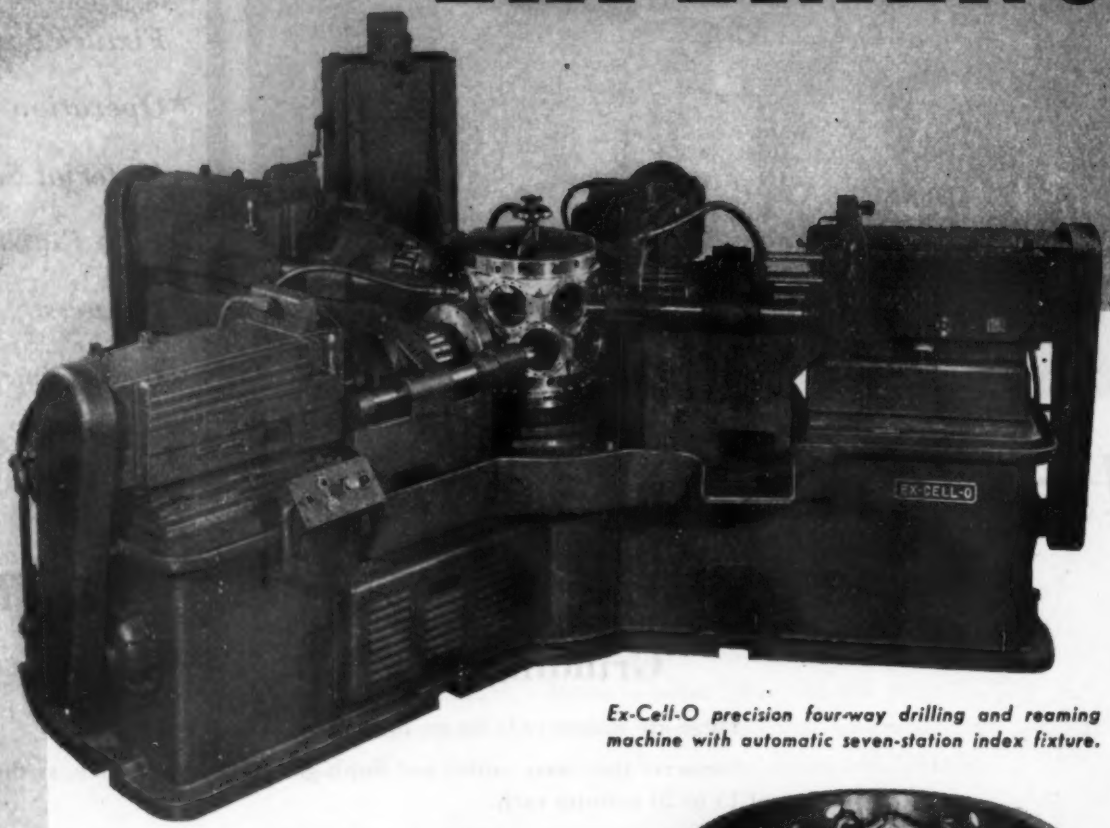


This job being done on the No. 18 Blanchard Surface Grinder

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS., U. S. A.

EXPERIENCE



Ex-Cell-O precision four-way drilling and reaming machine with automatic seven-station index fixture.

★

TYPICAL EX-CELL-O OPERATION

On the above Ex-Cell-O special-purpose machine, aircraft crankcase sub-assembly of aluminum alloy is *precision* machined automatically except for loading and unloading. Part is loaded from top over center post to assure rigidity. "Start Cycle" button is pressed, and machine drills, reams, spotfaces and chamfers 16 stud holes in each of 14 deck pads (total of 224 holes, two operations per hole), then stops, ready for operator to unload and repeat the cycle. This part was formerly machined one bank at a time. Now, with this Ex-Cell-O machine, handling and operation time is exactly one-half what it was; error between banks of holes, radially and vertically (due to reloading of part), is eliminated; also, by one machine only now being required for the job, floor space is reduced.

Increased production attained in precision machining of this aircraft crankcase on Ex-Cell-O special-purpose machine.

PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • TOOL GRINDERS • GRINDING SPINDLES

. . . no substitute for it!

Ex-Cell-O's wide experience in designing and building special machines to increase output and lower costs assures you practical advantages in your immediate or near future production

• You have a substantial background of experience to draw from when you bring to Ex-Cell-O your problem in the *precision* machining of metal parts on a high production basis . . . whether it concerns an immediate war production job or a future product you are now planning. The more economical production of accurate metal parts necessitates single-purpose machines of improved efficiency, capable of giving greater output and reducing unit cost. For years Ex-Cell-O has been an acknowledged leader in the field of special-purpose machines . . . *precision* machines with exclusive features that represent the utmost in accuracy, production, operating ease, rigidity, and durability. Every special machine manufactured by Ex-Cell-O is designed to give the most practical results on the job for which it is built — improvement in the quality of the work, direct savings in both time and money, and maximum service and life in the machine itself.

This is why you should utilize Ex-Cell-O's experienced engineering and manufacturing facilities. Ex-Cell-O has representatives in all of the nation's principal manufacturing centers. Consult the one nearest you, or write to Ex-Cell-O Head Office in Detroit.

EX-CELL-O CORPORATION • DETROIT 6, MICHIGAN

If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision and speed in production, send your name, company, address and position to Department of Public Relations, Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan. Current issue of TOOL TIPS (Vol. 18, No. 4) illustrates a variety of special machines designed to meet many modern production problems.

XLO

EX-CELL-O *for* PRECISION

HYDRAULIC POWER UNITS • BROACHES • CONTINENTAL CUTTING TOOLS
DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • PURE-PAK
CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

FOSDICK RADIAL *on*

special circular base . . . saves time . . . insures accuracy

● Drilling large diameter holes in tough metal is one way that the Fosdick Radial demonstrates its ability to handle tough assignments . . . It also shows how Fosdick rigid construction aids productivity and meets close tolerance demands . . . Fosdick Hydraulic Radials have "what it takes" to maintain precision production — well balanced arm and head construction — and finger tip control of all feeds and speeds in the head . . . Want further details? Write for Radial Bulletin RA.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

NEW NORTON Vitrified DIAMOND HONE

EXTENSIVE field tests prove that this new Vitrified Diamond Hand Hone—a strictly Norton development—has these advantages:

1. **Up to 50% faster cutting action** than resinoid type hand hones—and even more compared to metal hand hones.
2. **Up to double the life** of resinoid hand hones for the same depth of diamond section.
3. **Few dressings required.** Metal diamond hones tend to dull and must be dressed frequently.

Available in stock in two types: diamond section one end—320 grit; diamond sections both ends—320 grit and 400 grit. Call your Norton distributor or Norton abrasive engineer.

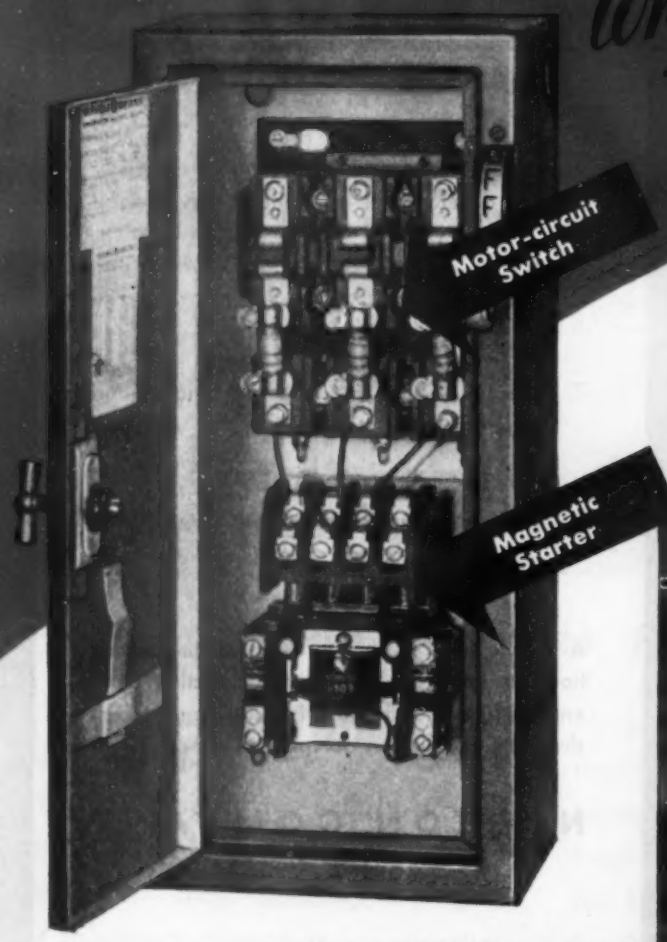
NORTON COMPANY
Worcester 6, Mass.

NORTON ABRASIVES

You can save time and space -

ONE COMPACT

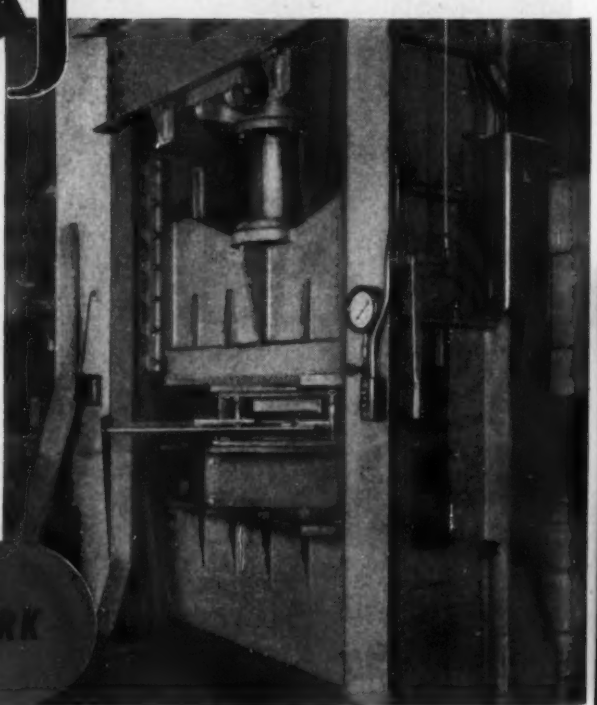
Why two devices? ONE



GE

COMBINATION STARTER

Combination starter and push-button station on a press



G-E COMBINATION STARTERS AT WORK

- - - gain greater protection too

UNIT

FOR MOTOR CONTROL AND PROTECTION

can do the job.

YOU no longer need buy a separate device for each function of motor control. Now you can get *combination* control—in a *variety of enclosures* to meet every operating condition. This control combines a motor-circuit switch and a magnetic starter in one, compact, easy-to-mount unit.

By using these starters you profit five ways:

1. Quick Selection—By ordering *one* factory co-ordinated unit instead of two, you can save time. You just specify the motor rating and indicate the type of motor-circuit switch you want and the type of application you have in mind—we'll send you the starter you need.

2. Reduced Installation Time—Users of combination starters report a 50 per-cent reduction in mounting time and a 40 per-cent reduction in wiring time.

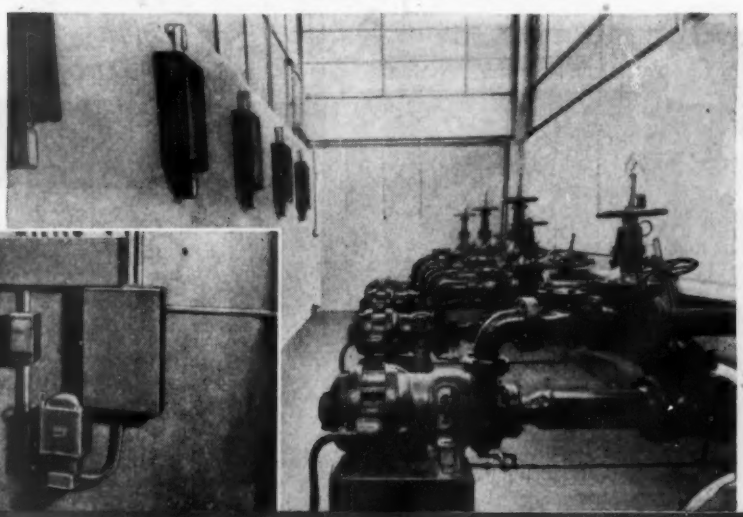
3. Motor Protection—With G-E combination starters, you're sure that the rating of the motor-circuit switch or breaker matches that of the magnetic starter with which it is to be used. The co-ordination of thermal overload relays with the fuses or breakers affords complete motor overcurrent protection under any condition of operation.

4. Greater Safety—The motor-circuit switch, being in the same case with the magnetic starter, is mechanically interlocked with the cover. Thus the cover cannot be opened while there is power on the starter.

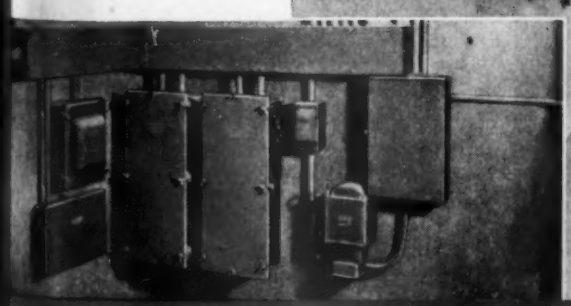
5. Less Space Required—Combination starters take less mounting space than separately mounted safety switches and starters.

These starters are also available for high-voltage starting. For further information on combination starters write to your local office for Bulletin GEA-3715. *General Electric Company, Schenectady 5, New York.*

Combination starters (on wall at left) installed in a pump room



For reliability of operation, combination starters with dust-tight enclosures in a grain elevator



Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds

GENERAL ELECTRIC

Compare new Ampac A-C WELDER with:

D-C WELDERS..

▶ Unlike d-c welders, Ampac a-c welder has *no arc blow!* That means welding speed is increased 15 to 30% on heavy work.

▶ Transformer type construction of a-c Ampac has both higher efficiency and lower idling loss than comparable m-g type welder.

▶ At no load the Ampac "400" idling loss is 200 watts—the idling loss of a typical m-g 400 amp d-c welder is 3100 watts. At 2¢ per kw/hr, the d-c unit wastes $1.49 in a full 24-hour day — Ampac's loss is less than 10¢!

▶ Initial cost of Ampac is lower — about 1/3 less than for a comparable d-c welder.

▶ Ampac's maintenance is lower because there are only three moving parts on the whole welder. There are *no* brushes to change—*no* commutator to dress.

▶ One control regulates entire welding output on Ampac a-c welder. Most d-c units have two or more controls. Result: Ampac saves adjustment time, helps speed production.

▶ Ampac can be used on any standard a-c voltage — 220-440 and 208 v, 60 cycle . . . without the extra expense of 3-phase installation as required by d-c welders.

OTHER A-C WELDERS..

▶ On Ampac — and Ampac alone — voltage is *automatically* raised for ideal arc striking at low currents. That provides perfect welding characteristics over entire range.

▶ Ampac's 3-piece core arrangement is exclusive among a-c welders. Provides basis for Ampac's high efficiency and low idling loss. Compared with the two largest selling 300 amp a-c welders, idling loss of the new Ampac "400" at no load is 14% lower than one, 61% lower than the other.

▶ Complete welding range is covered in only seven turns of Ampac's control wheel.

▶ Unlike many a-c welders, Ampac has handles, crane hooks and welding terminals that attach *directly* to the core. Case acts *only* as a protective shell. Damage to case cannot harm structure of electrical parts within.

▶ Ampac has no stray flux to heat up the case. Reactor coil surrounding the variable air gap forces every line of flux into active duty.

▶ Ampac "400" is the ideal size a-c welder. It's large enough to use 1/4" rods, 24 hours a day — which 300 amp units will *not* do. And the average 500 amp unit is rarely used at over 450 . . . while Ampac range is 50-500 amps.

♪ *Tune in the Boston Symphony, Blue Network, every Sat. Eve.*

GET COMPLETE FACTS on this great new Ampac a-c welder from your nearby Ampac dealer or Allis-Chalmers district office. Learn how its patented circuit cuts costs — increases production. Ask for bulletins B6241, B6302.

ALLIS-CHALMERS
MILWAUKEE 1, WISCONSIN

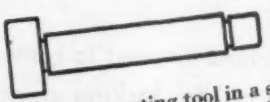
A 1703

Quick conversion

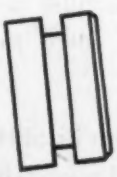
from War to Peace with the Monarch Magnamatic

Typical Magnamatic Jobs

Step shaft turned on a Magnamatic equipped with automatic feed changes for the three diameters of .025", .040" and .050" respectively. This feature saves valuable time on work like this.



On this job, two pieces are turned from each bar and separated by a parting tool in a separate operation. Total set-up time 8 minutes. Production, 45 complete pieces per hour.



Combination of chucking and step shaft turning on a Magnamatic equipped with air chuck and boring bar holder. Set-up to change from work between centers to that for automatic chucking takes only a few minutes.

Monarch Magnamatics will save many man-hours and machine-hours for war work, and then can quickly be converted to peacetime production without retooling.

Magnamatics are the most universal automatic lathes ever built. They will do a wide variety of turning, boring, facing or chucking work, with any number of diameters and lengths and with intervening contours or tapers. A reasonable number of tools in the rear carriage slide can be used for facing, necking, forming or chamfering. Single point tools are guided by gage blocks, micrometer heads or metal templates, depending upon the work.

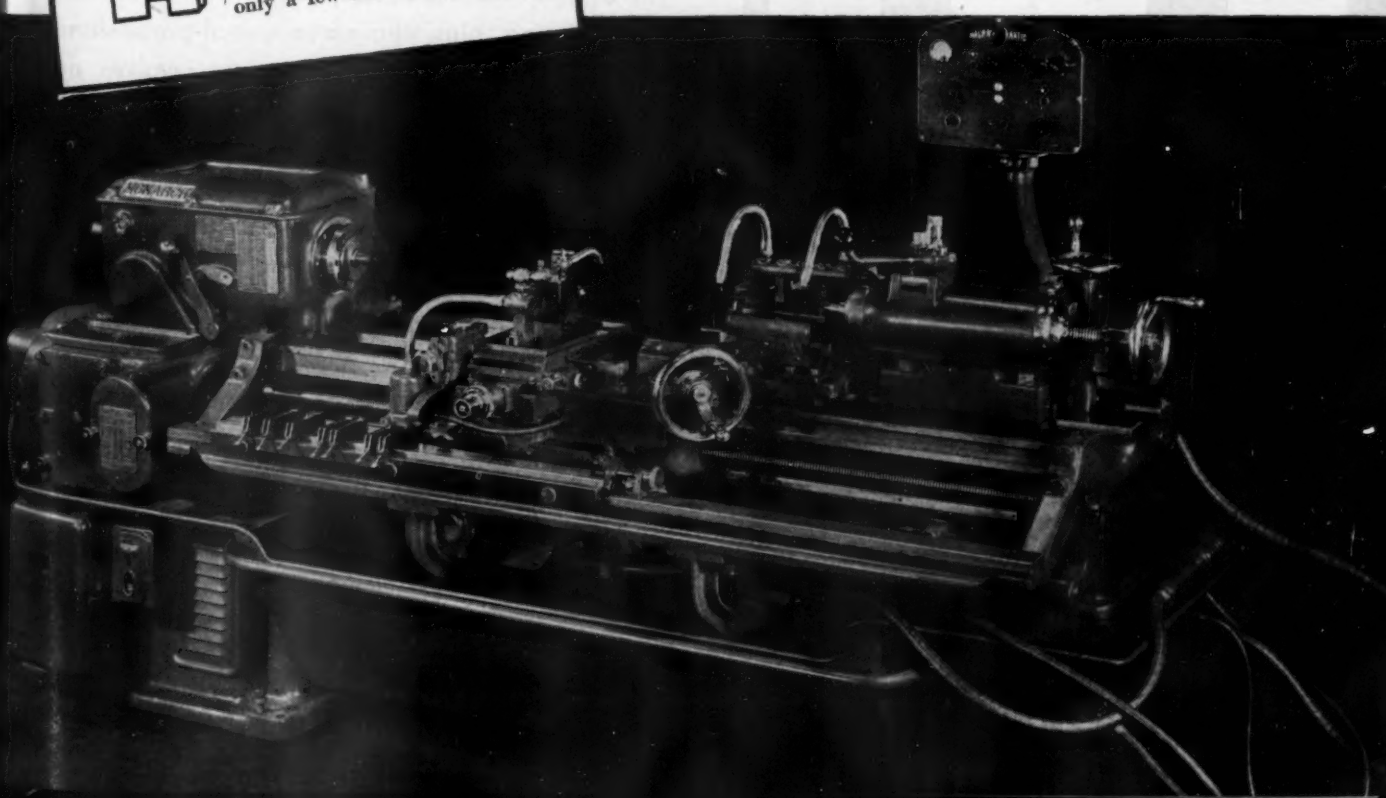
Because the average set-up time is from 5 to 15 minutes, Magnamatics are economical for short runs. Yet, completely automatic operation enables fast, accurate production of large quantities at very low cost. On most jobs, one operator can tend two or more machines.

The value of Magnamatics was widely proved before the War, but production was stopped to meet greatly expanded demand for standard and toolmaker's lathes. Reasonably short deliveries can now be made. Our engineers will gladly help you utilize Magnamatics for present war work and later for peacetime products.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

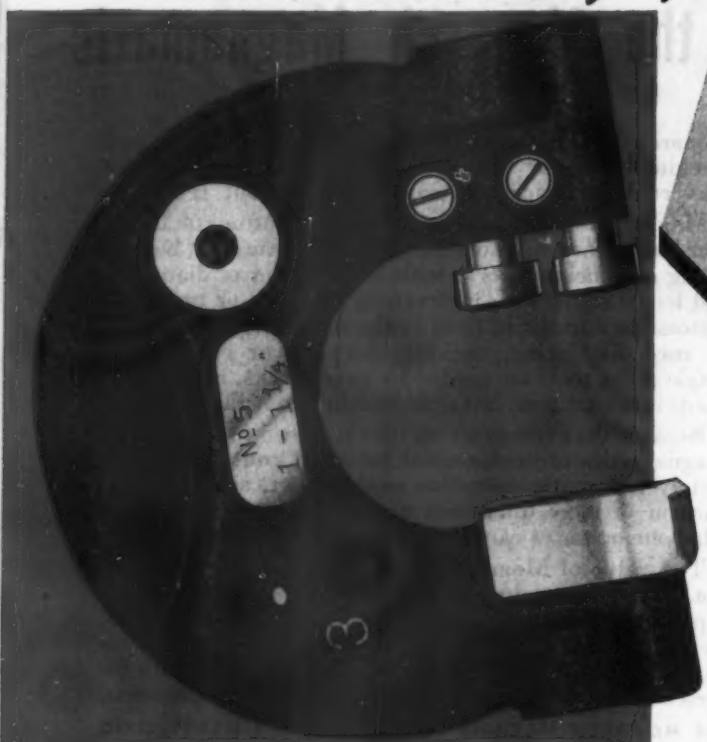
Direct factory branches at Chicago • Cleveland • Detroit
Newark • Pittsburgh • Representatives in principal cities.

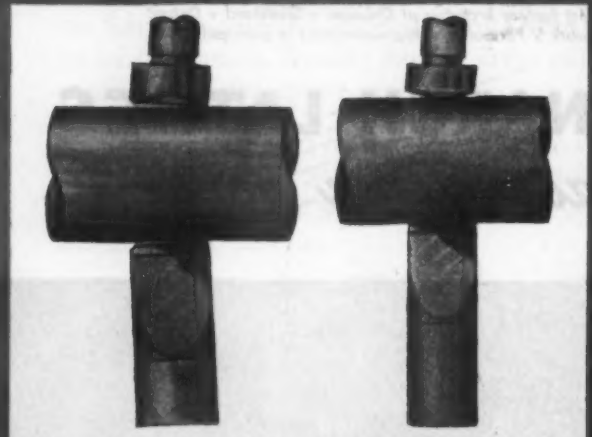
MONARCH LATHES
Save Time



STANDARD SUPER *Snap Gage*

with SPHERICAL Gaging Pins that involve no condition of parallelism, yet provide GREATER ACCURACY in PRECISION INSPECTION





Conventional Snap Gage with flat surfaced gaging pins. The tilt is exaggerated to make the diagram clear. Note that only at their edges do the gaging surfaces contact the piece being gaged.

This illustration shows the Super Snap Gage with the pin shank at the same angle as in the diagram at the left. Note that the contact conditions are exactly the same as if the pin were not tilted.

This illustration shows a Super Snap Gage mounted in a bench stand for convenience in checking.

IMMEDIATE DELIVERY from stock

A *new contact principle...* SIMPLE *and* PRACTICAL

SNAP GAGES are commonly used to control finer tolerances, but strain on the locking device distorts the frame thereby rendering the gage inaccurate. This distortion tilts the flat surfaced pins a few .0001" throwing them out-of-parallel to the common anvil, an important factor when tolerances are measured in .0001".

The STANDARD Super Snap Gage with its SPHERICAL gaging pins eliminates out-of-parallelism. This new spherical-contact principle involves no condition of sustained parallelism. The SUPER Snap Gage is easily set, requiring no simultaneous adjustment to a given dimension and to parallelism. It simplifies inspection, assures greater accuracy, and speeds production and inspection.

The return of out-of-parallel snap gages for correction is eliminated. Only pins and anvils need be held in reserve, instead of complete gages. The initial cost of the SUPER Snap Gage is no more. Pins are available as separate parts, to fit existing American Gage Design models.

Send for Illustrated Folder

ARMY (E) & NAVY

STANDARD GAGE CO., INC., *Poughkeepsie, N.Y.*

QUALITY

YOUR ONE SOLID ASSURANCE OF SPEED AND ACCURACY FOR WAR PRODUCTION

Illustrated is a typical application of the SUPER SERVICE RADIAL to wartime production. The job calls for operations on motor frames for Diesel-electric switcher engines . . . vital jobs, because the War Department, the Navy Department, Arsenals and many large manufacturers require these engines to speed essential transportation. For work of this character the SUPER SERVICE RADIAL is almost a standard. You'll find these famous Radials on the job, 3-shifts-per-day, 7 days a week, in countless war production plants from coast to coast. The Quality of their design—the Quality of their workmanship and construction—the Quality of their performance is such that the name "Cincinnati Bickford" on a Radial is sufficient to assure top operating speeds, unexcelled accuracy and "more holes per dollar."

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI, OHIO, U. S. A.

FOR *FASTER* CHUCKING
FOR *EASIER* CHUCKING
FOR *TIGHTER* CHUCKING

A TURN of a knob on the Warner & Swasey Power Chuck Wrench and the work piece is gripped tight—much tighter than a couple of husky men using an extension pipe on a hand wrench can grip it, giving it "everything they've got".

Warner & Swasey Power Chuck Wrenches on your turret lathes can save much valuable time on each chucking—reduce operator fatigue—and enable heavier cuts to be taken without breaking tools or spoiling the piece because of work slippage.

Or the Warner & Swasey Power Chuck Wrench can be dial-set for light, uniform holding grip on thin-walled, fragile pieces.

It all adds up to faster production!

Warner & Swasey Power Chuck Wrenches can be installed on your current model turret lathes

If you are doing light or heavy chucking work, better find out quickly what a Warner & Swasey Power Chuck Wrench can do for you—in faster production, less scrap loss, and better satisfied operators: See your Warner & Swasey field representative or write Warner & Swasey, Cleveland, Ohio.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . .
WITH A WARNER & SWASEY

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Fast, Fair and Final

THE COMPTROLLER-GENERAL of the United States is holding with bulldog persistence to the premise that all terminated war contracts should be subject to a meticulous and precise audit by his office before settlements are made.

He uses an alarmist psychology, pointing out the possibility of fraud and of a fleecing of the taxpayers if a more flexible plan is adopted.

But the facts seem to disprove his contention. Take the Army Service Forces, for example. Contract termination is handled by the district offices in which the original contracts were first made.

From six to thirty or forty people in a district office are associated with each claim settlement. The chance that collusion for purposes of fraud will develop under such circumstances is exceedingly remote. It may be a possibility, but certainly not a probability.

Should any case be unearthed that has about it the odor of fraud, it can be reopened even though it may previously have been closed. That is only horse sense and a natural precaution that will be taken in any event.

Over against the theory that prevention of fraud must be paramount, though it delay settlements by months, is the acknowledged necessity for speed.

Everyone, from Washington officialdom to the common laborer in an automobile factory, wants the period to be as short as possible between the end of a manufacturer's war operations and his reemployment of men for production of peacetime goods.

Manufacturers must have government settlement of their contract claims handled promptly if they are to have available the cash with which to finance reconversion.

If claim settlements are dragged out for months on end, that action alone will help to defeat the purpose for which all Americans will be striving—to get back into normal peacetime activities with a minimum of delay.

The Army and the Navy are eager to cooperate in achieving this laudable objective. They know, perhaps better than anyone else, the outstanding job that industry has done during the war. They do not want to put any obstacles in industry's way when its emergency job is ended.

The armed services are ready to apply a practical and workable formula suggested by a top federal official.

His rule is that contract terminations should be administered with only one rule in mind. They shall be *fast, fair and final.*

That rule is impossible of application if the comptroller-general's authority is interposed.

The Army's transportation expenses for the year 1941 have not yet been audited by the comptroller-general. That is a good example of how fast the comptroller-general would move on contract termination.

Imagine that turtle's-pace prevailing in the settlement of hundreds of thousands of war contracts! If the war should end in 1945, settlements would still be in the making in 1950.

For the sake of a speedy reconversion after the war, hard and fast slide-rule settlements must be sacrificed in favor of a rule-of-thumb commonsense policy.

Fast, fair and final must be the sole criterion.

Burnham Finney

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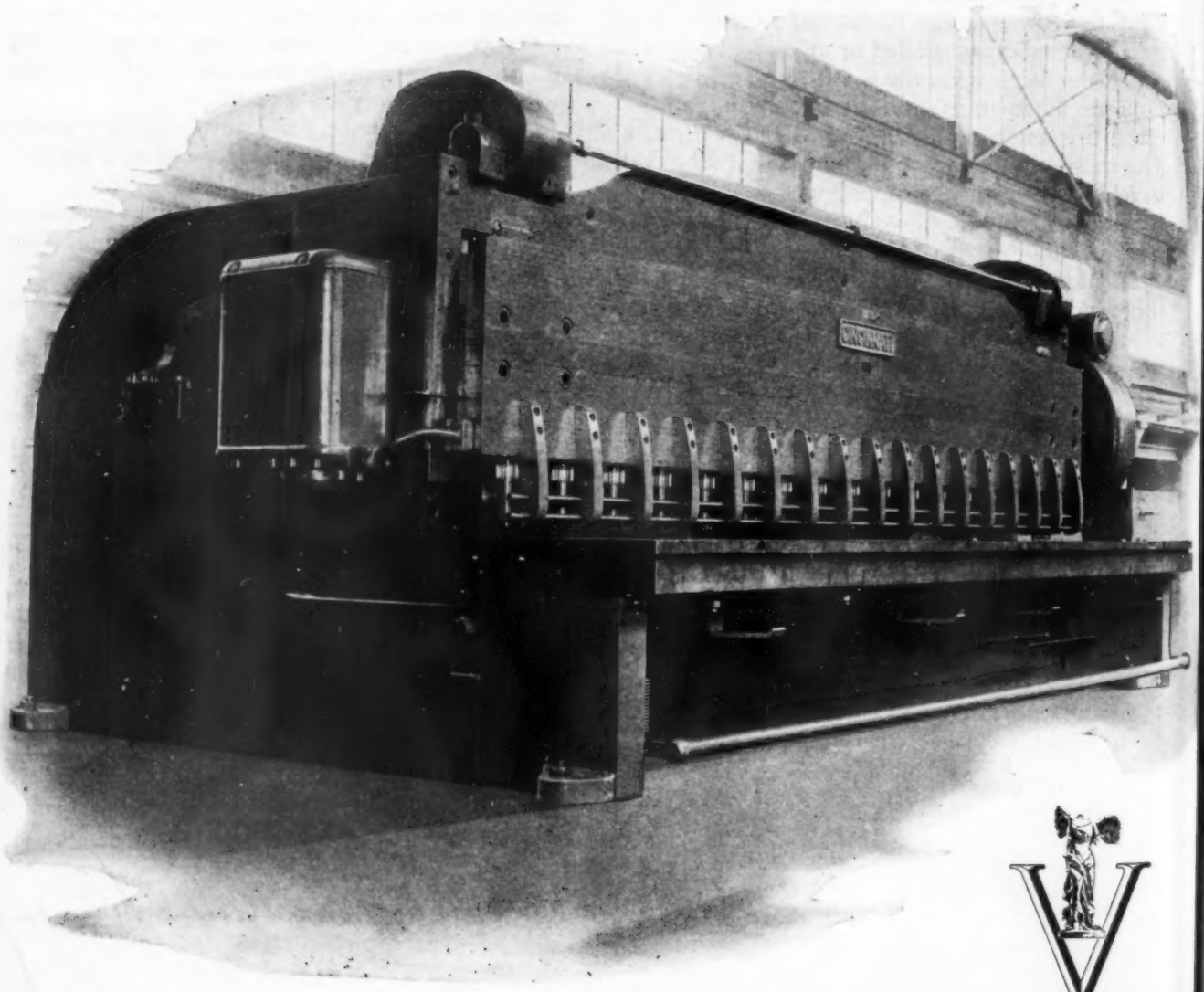
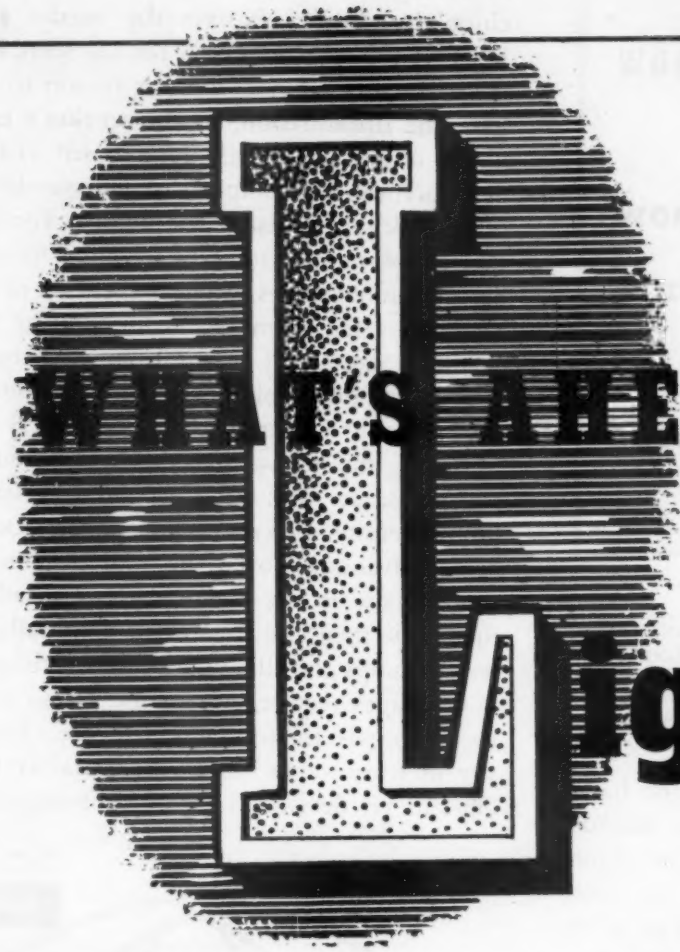




WHAT'S AHEAD IN Lighting

LIGHTING—at first glance—may seem somewhat foreign to a general discussion of metal-working, but lighting is now, and will continue to be, recognized as an important production tool. Lighting chosen with the same care and consideration as a machine tool can increase production, eliminate faulty work, cut absenteeism and reduce worker fatigue. Conversely, poor lighting can be the monkey-wrench in an otherwise well-geared production plan.

In addition to gaining a new stature in the production scheme, illumination has been recognized as much more than suspending a number of lighting fixtures at certain intervals from the plant's ceiling. Anyone considering lighting for plant or office now takes into account the quality and quantity of light, plant lay-out, wall and floor coatings in addition to actual fixtures.

Probably the biggest step forward in lighting during the war has been planning lighting along with other details of new buildings, rather than treating illumination as a necessary evil which must be provided for along with brooms to sweep the floor. Architects, master mechanics and production officials are all interested in the problems involved in providing see-ability for workmen.

War, with its round-the-clock production, threw added emphasis on light, for it was found in many plants that night production was all out of line with daytime production. Although other factors accounted for some of this variation, much of it was traced to poor lighting. Likewise, the advent of windowless—or blackout—plants threw production schedules wholly to the mercy of artificial illumination, and lighting "came through."

Windowless plants are likely to stay because they have shown many advantages for precision production plants. First, many plants doing precision work have found that air-conditioning is a requisite to accurate work all year long. Second, it has been learned that a combination of natural and artificial light is worse, in many cases, than a low level of either. Too, the cost of air-conditioning is much greater than adequate lighting for like areas. Thus, plants which shut out the sun's heat save considerable air-conditioning expense. Even

METAL-WORKING TOMORROW

—third in a series

Care equal to that now given choice of machines will govern selection of lighting in future shops

plants with windows are replacing clear glass with tinted panes that cut down the sun's brilliance and the heat which passes through the windows. This also makes easier the task of providing controlled illumination.

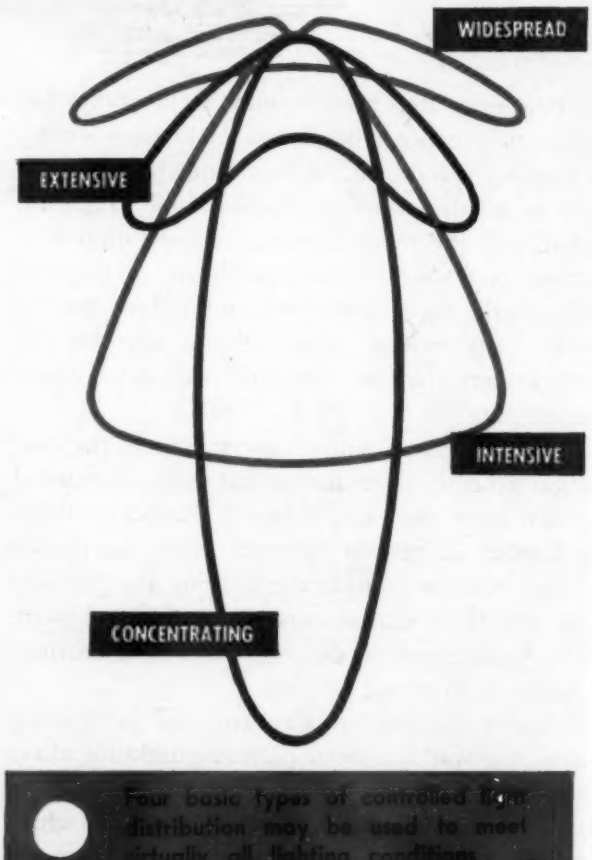
The gospel of proper lighting and the habits formed in connection with its use in blackout plants are likely to be extended to most plants. For instance, lighting experts predict that from now on lights will be turned on at the start of the working day and will remain on until the day's work is finished. This is the first step in complete control over illumination. Some lighting installations have automatic controls which raise and lower artificial lighting in accordance with the variations in sunlight, but the belief is that this type control is too complicated and expensive when the same goals can be achieved otherwise. In other words, if proper illumination is installed and used regularly there is no need for further control over lights.

In attaining proper illumination one tool has been vastly overrated and over-worked. That tool is the light-meter, which has been long used as the final judge of lighting suitability. While the light-meter can and will record light intensity it does nothing to indicate reflected glare, dangerous shadows, and actual visibility of work. There are complicated instruments for determining visibility but these require considerable time and expert manipulation to obtain satisfactory results.

One lighting engineer has devised a simple—albeit homey—method for determining see-ability on jobs requiring sharp, clear lighting. He always carries with him an ordinary sewing needle of average size. In testing illumination at a machine, he slowly revolves the needle at work level; if the needle's eye is readily seen, lighting is satisfactory; if not, there is reason to investigate the illumination, or the worker's eyesight.

Too often, lighting has been chosen on the basis of theoretical light output without considering loss of efficiency of the lamp and fixture. For instance, the number and wattage of installed fixtures may be 40-50 foot-candles, whereas the level of illumination delivered might go down to 8 or 10 foot-candles. Some light is lost from all fixtures, and after a certain number of operational hours efficiency is only a fraction of the theoretical value.

Among the new wrinkles in lighting during the war period are cold-cathode fluorescent lamps and high intensity mercury vapor lamps. Both have some advantages over the more common light sources now in use and each have disadvantages that limit their use somewhat. Cold-cathode fluorescent lamps give illumination that is close to ideal, but voltages required for its use are so high as to be dangerous for indiscriminate use. High-intensity mercury vapor lamps are certainly the most efficient yet devised as far as light output and de-



Four basic types of controlled light distribution may be used to meet virtually all lighting conditions

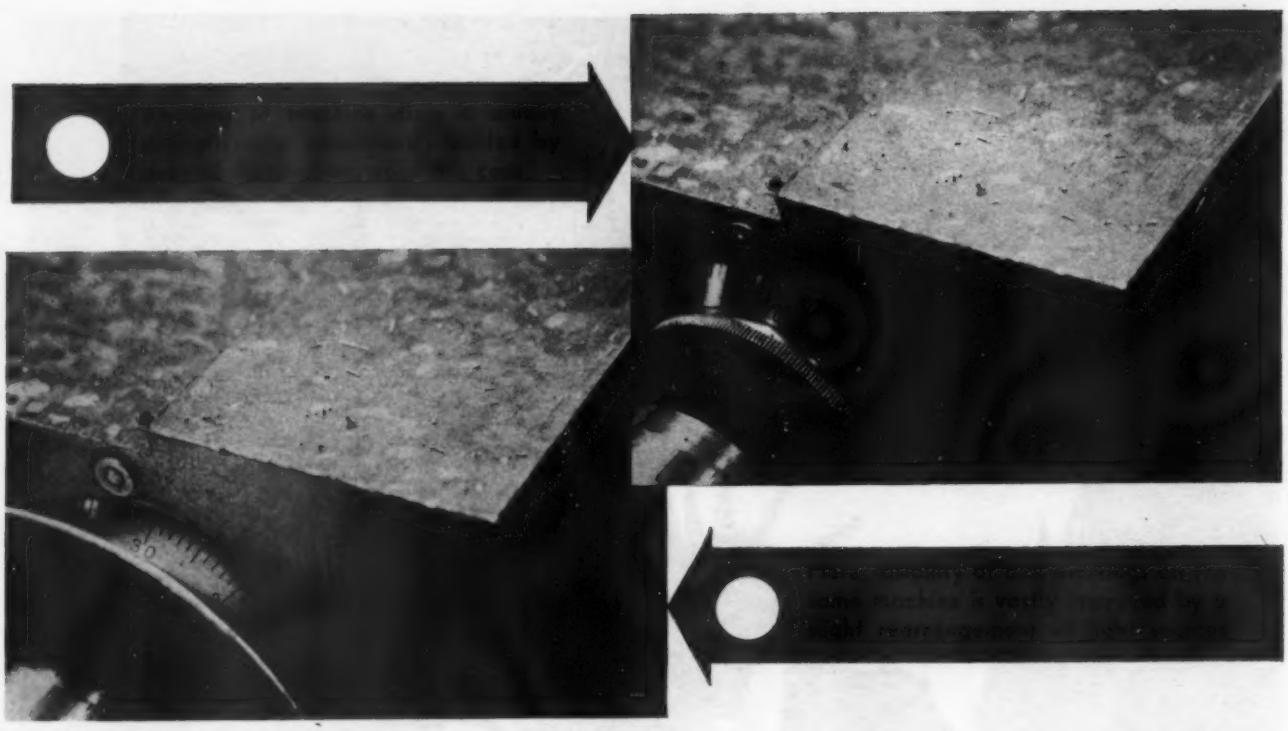
Light excitation from remote, wireless sources is now possible, but it will be many years before such lighting becomes a factor in industrial illumination

preciation are concerned, but thus far the biggest drawbacks to their more extensive use have been the sickly color value of the light, their slowness in starting and the fact that they must be combined with incandescent lamps to provide light of the proper color value.

Mercury vapor lamps are certain to be used in increasingly large quantities in lighting high-bay areas in tomorrow's plants, for it has been found that as wattages are increased, in this type lamp, the need for color correction is correspondingly reduced. Recently 3,000-watt mercury vapor lamps have been put into use, and they are expected to be made in sizes up to 10,000 watts. This latter lamp will produce, in a unit less than 2-ft. long, as much or more illumination than 1,000 40-watt household incandescent lamps.

Thus far, one of the most important factors in any lighting system has been considered much less than it should be. That is the human factor—the persons for whom the lighting system has been installed. Wartime personnel experience has sometimes been disheartening to management, but there is an obvious point that employees, or their representatives, should be consulted before new lighting is installed in a plant. Some lighting systems have been installed in accordance with all of the latest knowledge and practice and, to the expert, they seemed the last word, but shortly after installation they became the target for complaints of all kinds and were blamed for the real and fancied ills of employees. Brief explanations to the employees as to why a certain type of light was chosen, what it would do for them and minor adjustments to salve the workers' feeling overcame the complaints. So, in the future, employees or their leaders will often be given some voice in the choice of lighting.

The public has been bombarded from all sides



with a barrage of publicity about the coming wonders in lighting in learning of the marvels of electronics. Lighting experts themselves will be the first to deny that any more than a bare trace of these so-called wonders will have any effect upon the industrial lighting scene for many years to come. One of the most commonly described is the lighting system that is energized by high-frequency radio waves, rather than current carrying wires. It is true that remote excitation is being used, and with fine results, in some circumstances, such as for landing light on seadromes, but it will be a long, long time before every plant has a high-frequency station on its roof. It is quite possible that a miniature system of this sort may be used for its novelty value in display rooms and reception lobbies, but even that use is still rather far off.

New Lighting Tools

Lighting tools that are new and which will be available for industry in the future include fluorescent lamps of all shapes and sizes—discs, tubes, circles; ozone producing lamps for food protection, commercial bleaching and testing of inks and dies for fading; and radiant heat lamps that produce 95 percent heat and 5 percent light.

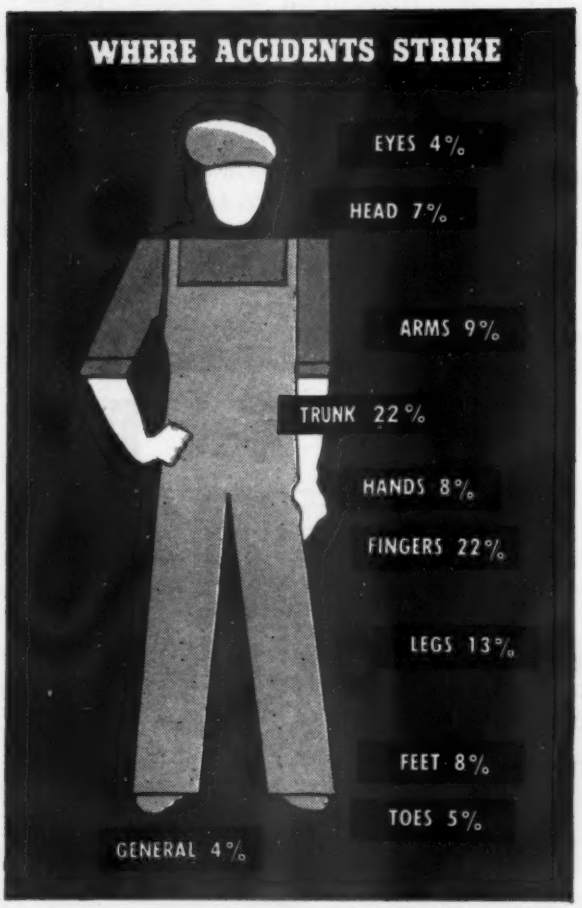
While lighting throughout shop areas will be vastly improved in the future, advances in lighting that will be of most interest to metal-working executives are those concerned with better illumination of machine tools and other production and inspection equipment. For many years, machine builders have furnished their equipment with no auxiliary lighting or at best an accessory lamp which could be swung into place when the workman felt he needed additional light. That situation will be remedied.

Even now, machine designers are planning built-in lights which will burn during all of the productive hours of the machine. These lights will be built-in, out of the way and such as to provide proper illumination for operations involved, regardless of other illumination. For instance, it is entirely possible that certain machine tools will have circular flourescent lamps built into the spindle in such a way that light is directed upon the center of work areas at all times. Too, small fluorescent-type bulbs, developed during the war for aircraft use, will be used to illuminate all machine micrometer dials and feedwheels, much as automobile dashboards are lighted now. In addition to providing better illumination, built-in lighting will help designers in their efforts to streamline machines and make them entirely self-contained.

All efforts to provide excellent general illumination may prove worthless if each individual operation is not carefully studied to determine actual visibility. One such study has led to the silhouette lighting of punch presses. On this type equipment there are no dials to be read or close measurements to be made during normal operation, but it is important that the operator be able to see the punch, die and work so he can be sure they are clean and

workable, thus preventing operation of the machine when conditions are such that damage might result. A light properly placed at the rear of the press silhouettes all essential elements so the operator can tell at a glance if everything is in order. A variation of the same type of lighting is now being used on some multiple-spindle drills so the operator can see that all chips are cleaned away at all times so the drills jigs and bushings will not be damaged by operating the machine.

Emphasis on proper painting of walls, floors, ceilings and obstructions in the path of light sources has had much to do with improved lighting. White or light grey walls and floors have been responsible for a general improvement in illumination in many plants. Dark surfaces absorb light, while light ones reflect it and get more value from the lamp's output. Even more attention will be paid to machine painting. During the war came a movement to use two or more colors on machines, a comparatively dark color to cover the bulk of the machine and light colors to identify moving parts and as a contrast to outline work and working areas. Too, a color safety code, recently announced will add more color to machines. The use of brighter colors has been found to increase seeability, foster safety and promote cleanliness and good housekeeping on and around machines.



Powerful argument for proper local lighting lies in the fact that most industrial accidents involve fingers and hands being caught in machinery

LOOKING AHEAD

- **Mercury vapor lamps will be used for lighting high-bay areas**
- **Only a trace of the coming wonders in lighting will affect industrial illumination for many years**
- **Machines will have built-in lights that burn during all productive hours of the machine**
- **Low voltage lighting is due for an upsurge after the war**
- **Lights will be used at the rear of many machines to silhouette all essential parts and operations**

Some of the latest plants are of all-concrete construction. The interiors of these buildings are finished with a brilliant white concrete surface which serves the same purpose as a coat of light paint. Floors so covered reflect light upward to illuminate the underside of machines and large parts, increasing the general overall vision.

It is felt that considerable use will be made of luminescent paints in future plants. These paints absorb light from any source and when all light is taken away they glow for periods varying from a few minutes to several hours. Such paints will be used for making doors, safety and fire equipment, electrical switches and exits so that such places and objects can be found in the event that light sources fail or that illumination must be cut off for any other reason.

Each machine and each work area presents a separate and distinct problem of illumination. Light that would be ideal when vertical surfaces are to be considered is entirely inadequate for horizontal surfaces. Each will require a certain type of fixture and a different method of mounting.

Some lighting experts feel that low voltage lighting is due for a great upsurge after the war. This will be especially true of built-in machine lighting, as the lower voltages eliminate much of the hazard which might be encountered when using standard voltages. In addition to being safer, low

voltage lighting is considerably less expensive in operation than voltages currently used. It is true, that more and larger wiring is required to carry the low voltages, but after the initial outlay costs are much less. Power itself costs less, and depreciation of lamps is much slower.

Maintenance Important

In the future much more attention will be paid to the care and upkeep of lighting systems. This is especially true of fluorescent systems, as it has been learned that such systems must be kept clean for most efficient light. Tubes and reflectors must be cleaned on regular schedules and tubes replaced regularly else the general level of illumination will drop below its established value.

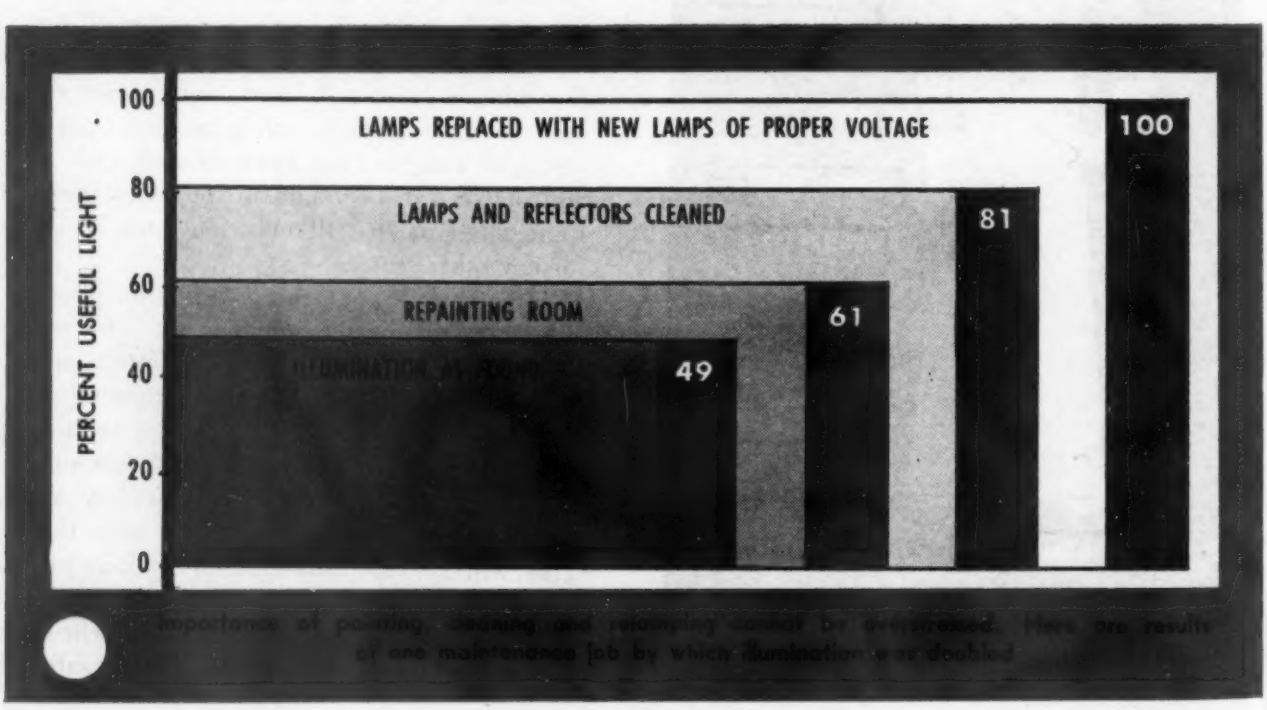
Costs of lighting will be scrutinized as carefully in progressive plants as are other production costs, since it has now become a production factor. Original cost will probably be the least considered of the factors. Choice of equipment will be made on the basis of whether it will provide such illumination as has been established as necessary or desirable; rate of efficiency drop; maintenance costs and wiring costs. Although lighting will be the smallest charge against the cost of a product it is likely to be considered as certainly as material and labor costs. If lights are burned constantly, as is expected in most plants and necessary in windowless plants, power rates may be reduced, as utilities can better estimate their loads and produce more cheaply and efficiently.

To show how lighting has improved in industry we have but to point out the increase in illumination levels. In 1939, average industrial illumination was 7 foot-candles. In plants constructed since that time illumination is at the rate of 40 to 50 foot-candles at the work level, and this is in addition to the localized bench and machine lighting. Too, light fixtures have been placed so as to eliminate shadows. For instance, fluorescent fixtures have been placed in long strips and then supplemented by fixtures placed at perpendiculars; they have been placed in U-shapes around certain types of machines and operations and they have been placed in relation to operations in such a way that light cannot be reflected into the eyes of workmen.

Comparative Figures Obtained

Little in spectacular development in lighting is expected during the next several years, but huge wartime installations have given cost and quality comparisons that will enable industry to get the best lighting for its needs without resorting to guesswork. Thus each plant and its own peculiar problems can be cared for out of the accumulated knowledge gained while providing see-ability to other plants engaged in the greatest production battle the world has ever known.

Incandescent lamps will hold their own during the coming era, for under certain conditions they are the cheapest and most efficient to use, although mercury vapor lamps will find increasing use in high-bay areas and fluorescents in low-bay, offices, drafting rooms and for much of the localized bench lighting that is to be provided.



INVASION *and the* FINAL CHALLENGE

The idea that our national security some day would depend upon the successful invasion of continental Europe by our armed forces was inconceivable to the average American but a few short years ago. Yet, today our whole strength is assembled to that very action and for assuring a sound and permanent peace.

America became great without aggression . . . without tyranny. Our greatness has been achieved without destroying others . . . ours is a history of unprecedented industrial progress, of development of our own resources and reliance on our own efforts.

Aggression is foreign to American philosophy. Yet, today we find ourselves faced with the choice of destroying or being destroyed. Today we are confronted by the hard fact that the kind of peace which we all so fervently desire can be achieved only by crushing autocracy and by removing the causes of aggression.

We are now engaged in the accomplishment of the first objective. Since Pearl Harbor a complacent, peace-loving America—the largest of the "soft" and "decadent" democracies—has grown strong and tough. Out of the inherent virility of a free people we have moulded the mightiest force for invasion and attack that the world has ever seen.

We have reached our peak rates of war production. We are producing as much war equipment as all the rest of the world combined.

History will record our industrial mobilization as a phenomenal achievement.

The battle of production has been won!

The full might of our armed forces and those of our allies unleashed against the Axis war machine will bring eventual victory. Two and a half years of intensive preparation, backed by 168 years of growth as a free nation, has given us superiority over twenty years of painstaking preparation by the totalitarian and militaristic countries with their enslaved peoples.

Every American has contributed toward this powerful offensive. Our manufacturers and business leaders have exerted their fullest efforts. Our industries have mobilized their tremendous resources—tapped to the fullest degree their inventive and productive genius. The men and women in the factories, on the farms, and in the mills and mines have played a magnificent

part in the tremendous production program. Citizens all are making their contribution to the armed victory that lies ahead

We have demonstrated that a free people under a free enterprise economy can unite in a common purpose.

* * *

When the war is won, we shall be faced by our second objective . . . removing the causes of aggression. This is a social challenge. A challenge to those who would sacrifice our democratic way of life for personal gains or foreign ideologies.

The best insurance for the continuance of our democracy is a successful democracy. That means a dynamic and not a static democracy. All of us who want to preserve the ideals that have made America . . . and that includes all but a handful of extremists . . . must determine to find the policies and programs which will permit us to make the most of the abundance nature has provided for us.

To achieve this end we must recognize the fact that we are but a wheel in the machinery of world economy. A wheel that must drive or be driven. A wheel that must mesh smoothly with the many other wheels or be stripped of its cogs.

We are the only nation on earth free enough and strong enough to shape the mould of its own destiny. We can be hampered by nothing but our own confusion.

* * *

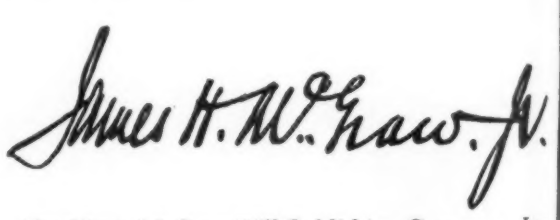
The mind and the heart of all America today brood over the shores of Britain and watch over the narrow waters that wash the beaches of the Continent. And the prayers of all America go with each of those who embark upon that epic passage.

Those of us at home who are producing the fighting tools and who are so earnestly concerned with the problems that will face a postwar America, should see now, even if we may never have seen it before, that all our plans will be worth just exactly what the men and women who make that passage are prepared, competent, and inspired by their leadership to make them worth.

For those men and women are America!

They have gone out from rich homes and poor homes alike, from farms and factories, from schools and churches, from mines and ranches, from offices and studios, to take their places in the battle line. They are a cross-section of the America that is to be.

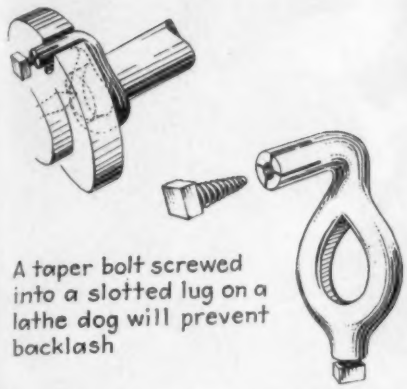
Whoever may draw the plans for that America, it is those men and women who will make the plans good. Invasion is their first step toward that end. May their work be speedily done, and may our plans be worthy of that work.



President, McGraw-Hill Publishing Company, Inc.

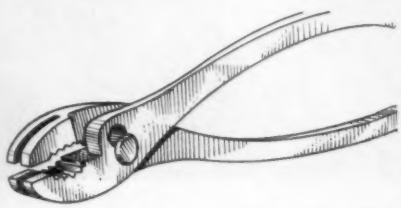
SHORT CUTS FOR THE SMALL SHOP

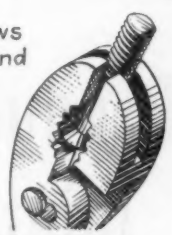
BY A. H. WAYCHOFF



A taper bolt screwed into a slotted lug on a lathe dog will prevent backlash

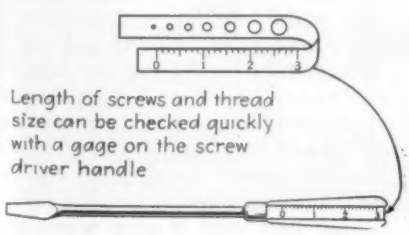
LATHE DOGS enter faceplate slots with a very free fit, and on interrupted cuts subject the workpiece to backlash and chatter. These can be eliminated by tapping the end of the lug on the lathe dog for a taper bolt, and then slotting the lug for a short distance. This permits the lug to expand against the sides of the faceplate slot when the taper bolt is tightened.





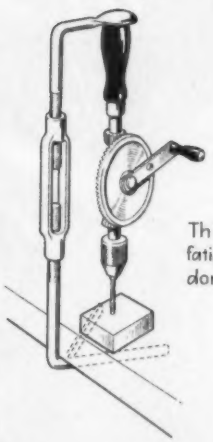
Slotted plier jaws hold round pins and bolts securely

PLIERS that have become worn and unable to grip stock securely can be renovated by slotting the jaws for about two-thirds of their length, using two hacksaw blades. Such pliers are ideal for holding bolts, pins, screws and cotters, because the edges of the slots afford a four-point grip on round stock.



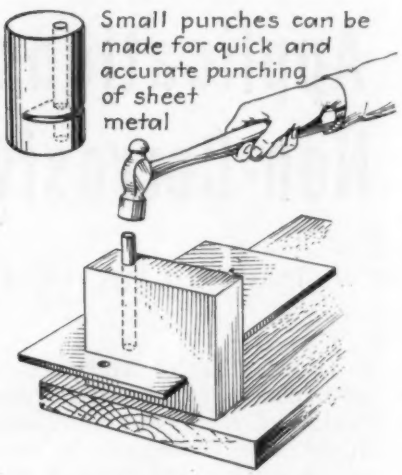
Length of screws and thread size can be checked quickly with a gage on the screw driver handle

SCREW GAGES applied to a screwdriver handle are convenient and useful. Slot the handle ½ in. wide and ⅛ in. deep, and fasten therein the gage shown here. One side is graduated in sixteenths of an inch, while the other side is tapped for the screw sizes most commonly used. Screws can then be checked quickly for length and thread size.



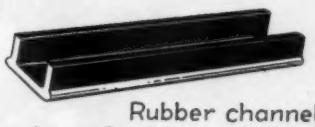
This "oldman" lessens fatigue and speeds work done with a hand drill

HAND DRILLS are infrequently used with an "old man." But one is convenient when drilling or tapping near the edges of workpieces. The one shown here is made of ½ in. rods threaded to fit a turnbuckle. One rod is shaped to fit the handle on the drill, while the other rod is yoked to grip beneath the work bench or the part being drilled.

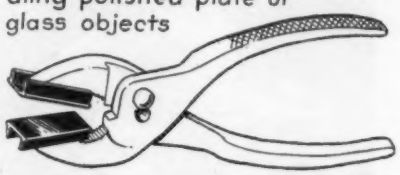


Small punches can be made for quick and accurate punching of sheet metal

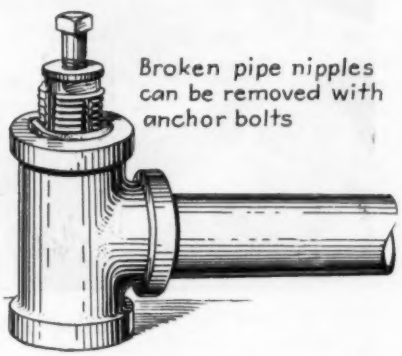
SHEET-METAL PUNCHES can be made from square, rectangular and round stock as shown in the drawing. Drill and ream the hole for the punch, and then slot the stock about 1 in. from the bottom. Harden the stock and the punch. The diameter of the punch, its position in the steel block, and the depth and width of the throat can be varied to suit the job at hand.



Rubber channels make soft plier jaws for handling polished plate or glass objects

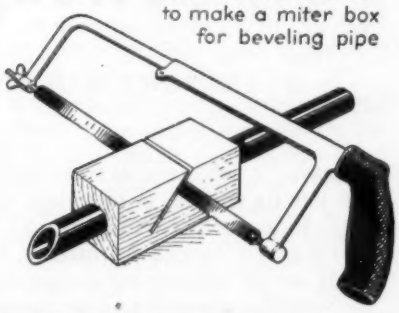


SOFT PLIER JAWS are often a necessity. They can be made from rubber channels used for automobile window guides. The pliers then can be used to handle polished plate, as well as parts made from glass and molded plastics.



Broken pipe nipples can be removed with anchor bolts

BROKEN PIPE NIPPLES are hard to remove, and gouging sometimes destroys the threads in the fittings. The broken end can be unscrewed by placing an anchor bolt in the nipple, expanding it securely against the nipple, and turning it with a stillson wrench.



Drill a wooden block to make a miter box for beveling pipe

BEVELED TUBING is needed when making welded pipe structures. A miter box for hand sawing such tubing can be made from a block of wood drilled to the tubing size and mitered to the angle desired. Soak the block occasionally in water. Hacksaw teeth will not cut readily into the wet wood.

Brazing bushing flanges on a condenser by using an oxyacetylene torch

Brazing Applications Produce Strong Non-Corrosive Joints

BY LAWRENCE D. JENNINGS, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

BRAZING, a relatively simple method for joining metals, is receiving wide application for parts that are too intricate to be formed by forging, too small or of unfavorable composition for welding, where liquid or pressure tightness is required, and for electrical connections. It is economical in that little equipment is needed, operators can be trained swiftly, and materials are conserved.

Brazed joints have four outstanding characteristics: Strength equal to from 90 to 98 percent of the base metal; good ductility to withstand severe shock, vibration and temperature change; high conductivity for electrical connections; and excellent corrosion resistance.

An important consideration is the selection of a suitable joint from the three types in general use—lap, butt and scarf. The lap or shear-type joint is most widely used because of its simplicity. The lapped areas should fit flat upon each other without pressure being applied during the brazing operation. The amount of lap is determined by the safety factor desired and can be from one to three times the width of the narrowest member. Lapped joints have strengths as great or greater than the joined members; electrical conductivity is greater because of increased section at the joint.

The butt joint is used where joint thickness cannot be greater than the thickest single member. Ends must be machined square and the fit-up must

be perfect. Thickness of the joint should be 0.002 in. for maximum strength and in no case greater than 0.005 in. The joint, when properly made, is nearly as strong as the parent metal but decreases the electrical conductivity slightly.

The scarf joint is used where more ductility and electrical conductivity are desired without sacrificing strength. It is a modification of the butt joint in that the joining surfaces are butted at some angle less than 90 deg., usually 45 deg. Over-all dimensions of the scarf joint are equivalent to the parent member.

Filler metal for brazing is a nonferrous metal or alloy having a melting point higher than 1,000 deg., but lower than that of the base metals or alloys being joined. In selecting the proper brazing material, consideration must be given the base metals or alloys to be joined, the type of joint and the method of application. Common brazing materials are pure copper, copper alloys and various silver-copper alloys.

Process for joining metals proves economical in fabricating small and intricate parts. Copper and silver-copper alloys used as brazing materials

Steel, copper and copper alloys can be joined by using a silver-copper alloy that flows at the desired temperature and produces the necessary strength. Phos-copper alloys are preferred for joining copper to copper because the phosphorous acts as a fluxing agent. It is not used for brazing steel parts, however. The flow temperature of phos-copper alloys is slightly higher than silver solders generally used, but it is less expensive. Pure copper is an excellent brazing material for steel parts. It permits high brazing temperatures without affecting the physical properties of the assembly. Snugness of fit in the joint and proper timing of the heating are factors determining strength qualities.

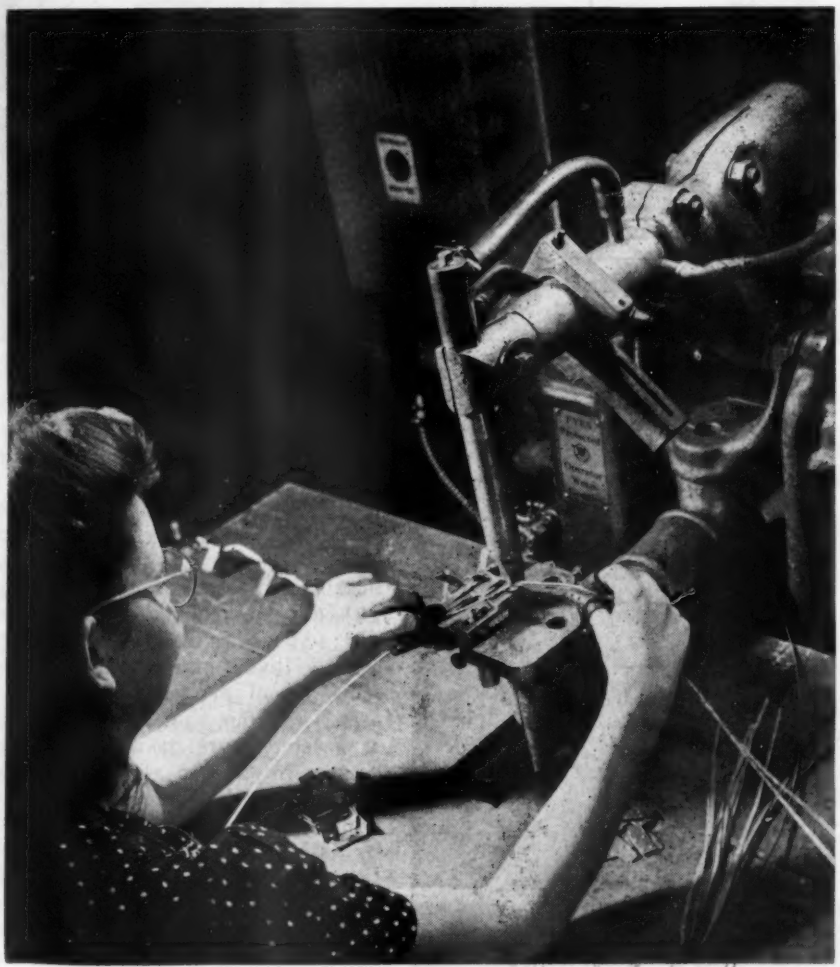
The three methods of application are: Hand-feeding, preplacing the alloy in or around the joint, and prefilled reservoirs.

Rods or strips are used for hand-feeding. They must be of a size that will melt quickly and provide sufficient material to the joint. Rods that are too small require long "feed-in," resulting in increased cost for labor and material. Too long a rod requires excessive heat or melting time and adds an over-quantity of brazing material to the joint.

Preplacing the alloy has advantages on repetitive parts since it prevents waste of costly brazing material and tends to control the brazing time. The alloy can be preplaced as inserts of thin sheets, flat washers or rings of round or special-shaped wire. Surfaces can be sprinkled or painted with powder or pre-tinned.

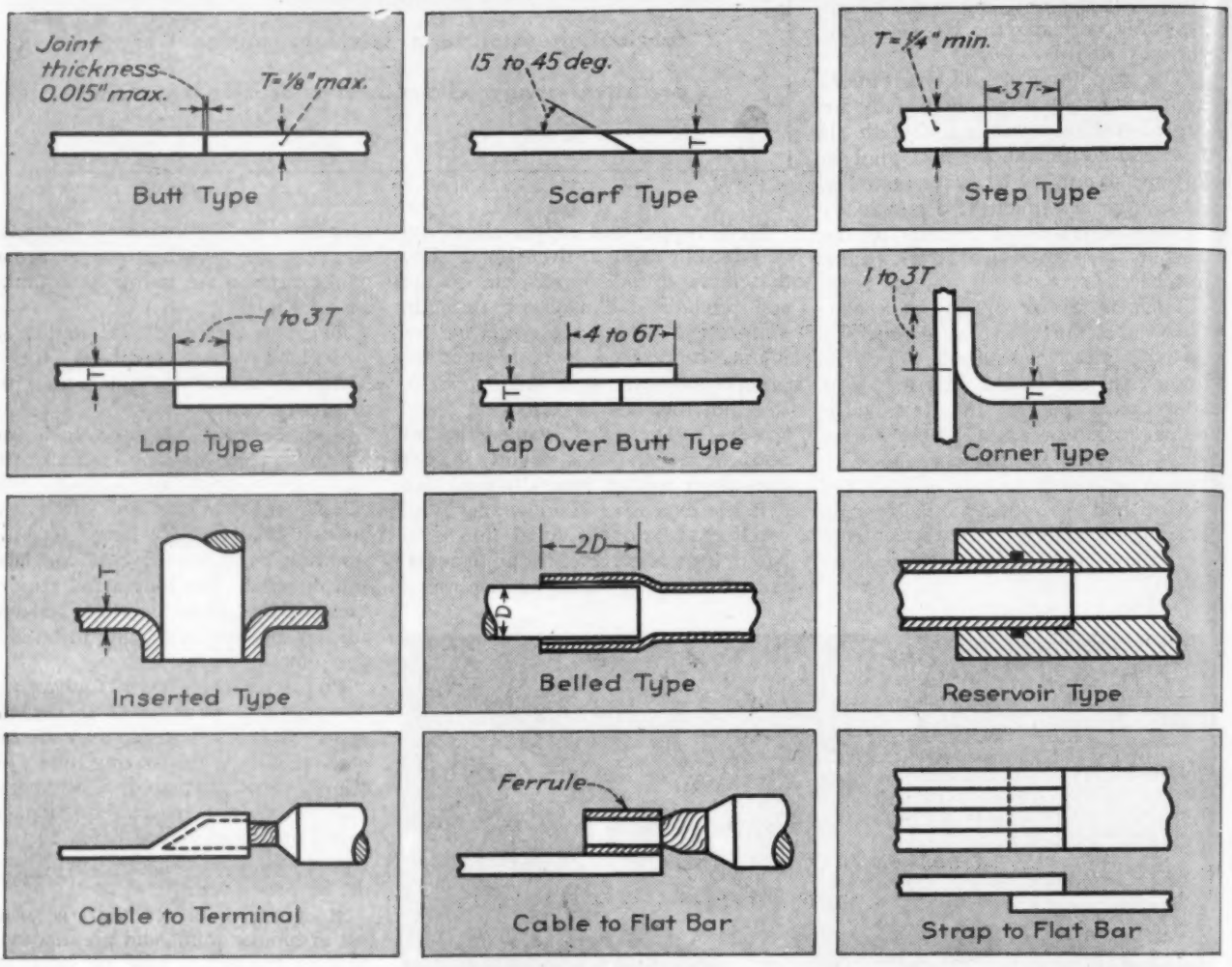
A groove-like reservoir is often cut in tubular joints and prefilled with brazing material. Type of joint and the position in which it is to be brazed determines size and location of the reservoir. Joints having internal reservoirs can be heated in any position since the fluid-brazing alloy will penetrate the entire joint because of capillary attraction. Joints having external reservoirs should be heated only in the vertical position with the reservoir at the top to allow downward flow of the heated alloy.

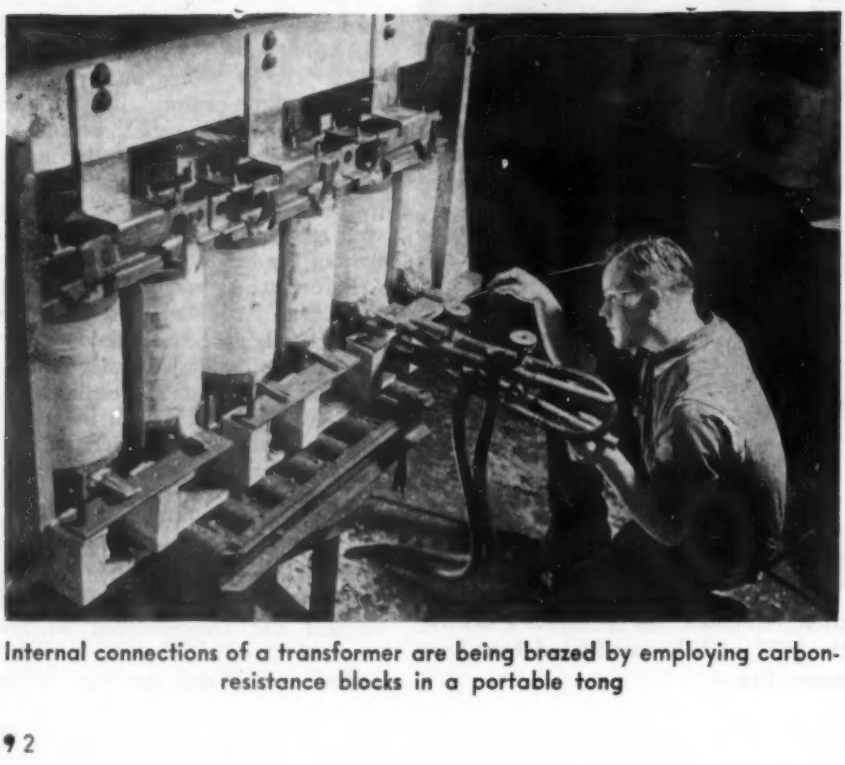
Before actual brazing begins, metal surfaces to be joined must be free of all dirt, oil, grease and oxides. Dirty surfaces are the basis of many brazing problems. Mechanical cleaning is advantageous because it can be done at the site of the brazing operation. Rag or waste can be used for removing oil, grease and dirt, and emery cloth or a similar abrasive removes oxide films. A fine file, wire brushing or grit blasting are effective cleaning methods. Chemical cleaning is more efficient and recommended wherever possible. A reliable solvent is used to remove grease and the part is then



Copper wire is being brazed to copper terminals. The preplaced brazing material is heated by resistance of the joint and the conducted heat from molybdenum tips

TYPES OF BRAZED JOINTS





Internal connections of a transformer are being brazed by employing carbon-resistance blocks in a portable tong

dipped into a suitable acid solution. Rinsing and rapid drying follow.

After cleaning, the metal surfaces should be covered with a flux, which is usually mixed with water and applied by brush. Fluxing performs three important functions: (1) Protects the metals from oxidation during heating; (2) dissolves any oxides that form; and (3) assists flow of the brazing agent. Fluxing insures a homogeneous joint free of pin holes and unbrazed areas. The flux should melt and flow at a temperature below that of the brazing material to assist flow of the latter during the heating cycles. After brazing, excess flux can be removed by washing in warm water. Discoloration near the joint can be removed by brushing or chemical dipping.

Patented fluxes are recommended since they have a flow point between 800 and 1,100 F., which is below the 1,175-1,300 F., melting point of silver solders in general use. Borax or borax-acid fluxes can be used but they re-

Machine brazing a furnace transformer winding using carbon resistance blocks and hand-feeding the brazing alloy

quire temperatures of 1,400 F. or higher, which are far above the flow temperatures of silver-copper alloys. They will not dissolve chrome oxides, however.

Heating methods for brazing range from gas, dip, electrical and furnace heating, depending upon the size, shape, quantity and location of the work.

Gas heating is done by a torch burning a combination of fuels such as oxy-acetylene, oxy-hydrogen, oxy-city gas, natural gas, butane, propane, air-acetylene. Torch brazing gives the best results when high B.t.u. gases are used since the rapid heat input decreases the possibility of oxidation. Modern high-efficiency torches should be used, particularly the multi-tip type wherever possible. The torch method is suited to repair shop work, one or two-piece items, and for large and intricately-shaped parts.

It is important that parts to be joined reach a brazing temperature simultaneously. Rapid, uniform heat should be applied. Heavier sections might require favor during the heating cycle. The flame should be directed at the underside of the joint away from the brazing material until the latter flows freely into the joint.

Dip brazing is adaptable to small parts, but has limited applications. In metallic-dip brazing, the part is dipped into a molten bath of brazing alloy. In the chemical-dip process, the part is carefully jigged, the brazing alloy preplaced, and the assembly submerged into a hot salt bath. The volume of the molten bath should be sufficient to prevent a marked lowering in temperature when the parts are immersed. The bath can be heated either electrically or with gaseous fuels.

Resistance brazing is widely used in the electrical industry for copper connections, bus bars and small parts. It is divided into two classes: Incandescent-carbon brazing by which heat is generated in the electrode and transferred to the part to be brazed by conduction; straight resistance brazing by which heat is generated by the resistance of the joint being brazed.

The incandescent method, using either stationary or portable equipment, is best adapted for joining bus bars. The brazing material is usually preplaced by using a thin strip between the parts, but equally good joints can be made by hand-feeding the alloy. In straight resistance brazing, standard spot welding machines can be used, but the electrodes should be of high resistance material. Preplacing the alloy is essential because the brazing time is too short for hand-feeding.

Furnace brazing is advantageous for heating parts in large quantities. The furnace can be of the batch or pushet type, heated by gas, oil or electricity. Hydrogen cracked ammonia or other suitable non-oxidizing atmospheres can be used. The brazing material is preplaced, the assembly is placed in the furnace, heated rapidly until the alloy flows, cooled and removed from the furnace. While the parts must be clean, use of flux is optional.

Developments in the brazing process has intensified the joining of stamped and formed sheet-metal parts. Further applications to speed production are indicated.

High Cutting Speeds and Machine Tool Design

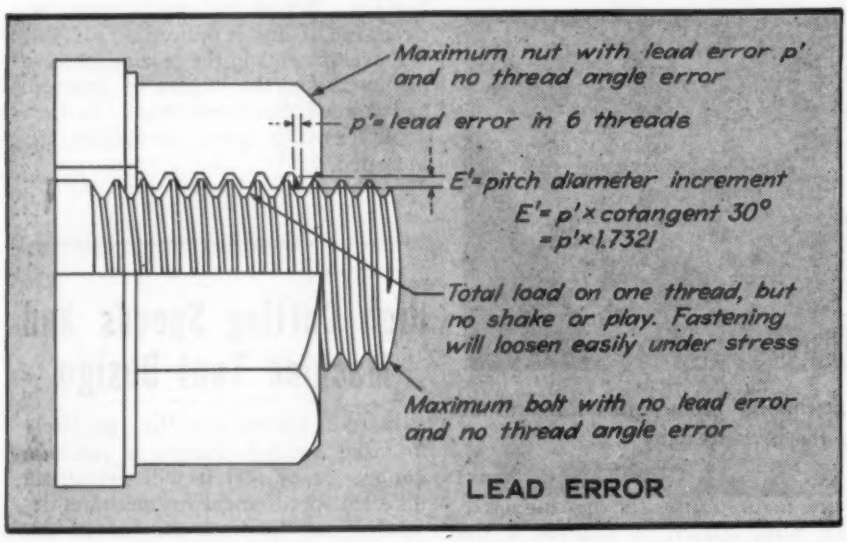
NEW HIGH SPEEDS in milling are likely to make decided changes in machine design. Many feel it will necessitate different speed ranges for machines depending on the work they are to do. It is possible that this may be accomplished by pick-off gears which shift the maximum and minimum speeds available each range. It is probable, however, that different types of bearings may be necessary for the two classes of work, so that the adaption of the same machine to both high and low speed will mean a different machine head.

Another phase of the high-speed cutter that must be considered is the length of time the cutting edge is in contact with the work. In the band saw the teeth have a comparatively long time to cool before they again come into contact. To a lesser degree this is true of milling cutters. Turning, however, is a different story as the contact is constant. On long cuts the heat might easily be an important factor in determining the speed. In any case there will be machine design changes due to the new technique which has been developed in the war industries.

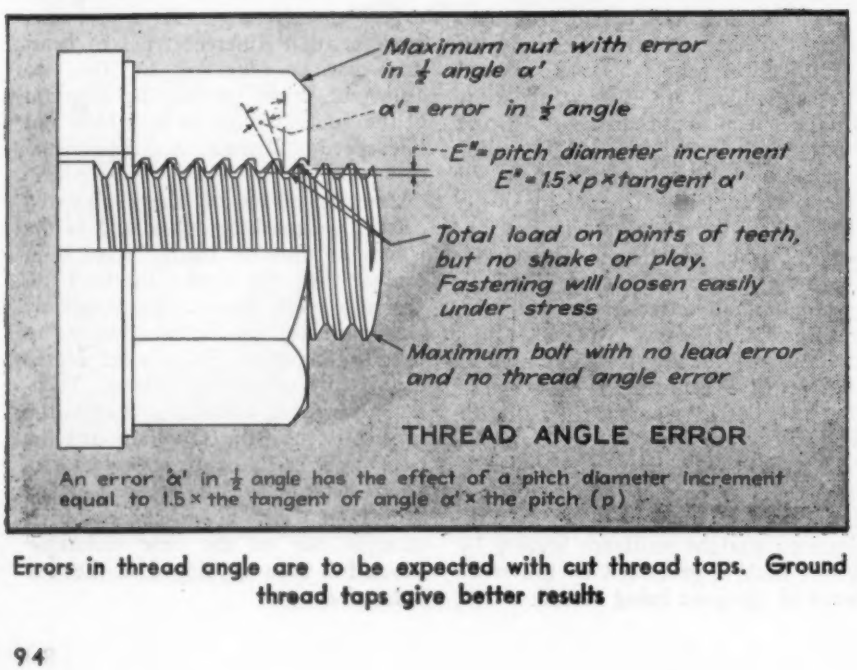
High Speed Precision Tapping Requires Proper Choice of Equipment

BY HERMAN GOLDBERG, CHIEF ENGINEER, R. G. HASKINS COMPANY

Here, in the first of a series of articles on precision tapping, are pertinent facts to help you get optimum results and maintain high production


Maximum nut with lead error p' and no thread angle error
p' = lead error in 6 threads
E' = pitch diameter increment
E' = p' × cotangent 30°
= p' × 1.7321
Total load on one thread, but no shake or play. Fastening will loosen easily under stress
Maximum bolt with no lead error and no thread angle error
LEAD ERROR

A lead error in the length of engagement has the effect of a pitch diameter error 1.732 times as great. Ground thread taps usually overcome lead errors


Maximum nut with error in ½ angle α'
α' = error in ½ angle
E'' = pitch diameter increment
E'' = 1.5 × p × tangent α'
Total load on points of teeth, but no shake or play. Fastening will loosen easily under stress
Maximum bolt with no lead error and no thread angle error
THREAD ANGLE ERROR
An error α' in ½ angle has the effect of a pitch diameter increment equal to 1.5 × the tangent of angle α' × the pitch (p)

Errors in thread angle are to be expected with cut thread taps. Ground thread taps give better results

PRODUCTION TAPPING of precision threads requires a knowledge of how and why taps are chosen, what equipment is used and what type of fit is desired. Therefore, in starting this series on tapping, it may be useful to review some of the thread standards, tap requirements and essential differences in various types of taps.

Accompanying tables show thread fits, thread series and recommended taps for the various classes of fits. These standards, established to permit manufacture of screw thread parts that are interchangeable, regardless of where made, have gone through a series of refinements to make them completely workable and understandable.

To tap holes to any specific class of fit requires first of all that a tap of proper tolerance be chosen. For instance, it would be inadvisable to use a commercial ground thread tap to produce a Class 3 or Class 4 fit. Commercial ground thread taps are used for average work such as Class 2 fits. For precise fits, precision ground thread taps are available in four tolerances and classed as Nos. 01, 1, 2 and 3. No. 01 is smallest in pitch diameter and No. 3 the largest; each number represents an increase in pitch diameter of 0.0005 in. The chief difference between commercial and precision ground thread taps lies in the latter being held to closer tolerances on the pitch diameter. All other dimensions are identical.

Although there is little difference in tolerances to which cut thread taps and ground thread taps are manufactured, there is often a vast difference in sizes of tapped holes produced. This results from distortion and lead error which make a cut thread tap cut larger than its actual size. A ground thread tap will reproduce its own size to very close limits. While it is sometimes possible to tap to precision ground thread limits with cut thread taps, it is best to use precision ground thread taps whenever accurate size must be maintained. They provide definite control over pitch diameter within the specified tolerance.

When taps of proper tolerance and style for the material being tapped are used, there should be no trouble in maintaining the desired class of fit. However, there are other factors which do enter into precision tapping, including cutting lubricants, type and condition of tapping machine, tap design and amount of hook in the tap. Accompanying illustrations show some common errors in tapped holes.

Cut thread taps have limitations arising from the manufacturing process. Warpage and distortion may result from lack of control over heat-treatment. Such inaccuracies may have little effect when tapping at low speeds, but they show up immediately when high speeds are used. The inaccuracies exaggerate themselves in the work and it is difficult to maintain consistently uniform work.

Lead errors cause a distinct swaging action, when tapping, and roughness causes excessive friction. Bent and distorted taps throw an additional burden on the cutting action. With all of the small errors that creep into a cut thread tap, there is little doubt about the desirability of using ground thread taps, even in small sizes, for all classes of tapping.

Most high-speed steel ground thread taps are ground from the solid after blanks have been machined and heat-treated. This permits use of the most efficient heat-treating methods, as the full high heat may be applied to obtain uniform hardness and ideal steel structure without danger of damaging threads. Too, final grinding rectifies any heat-treating distortion. Taps made this way are well within the limits of specified lead error, and pitch and root diameters and thread angles are also under control.

Manufacturers of cut thread taps usually allow a lead error of 0.003 in. per in. plus or minus, while lead error in ground thread taps is limited to 0.0005 in. per in., plus or minus.

High-speed steel ground thread taps cost more than cut thread taps, but cost per tapped hole is much less, as when tapping at high speeds a ground thread tap will usually produce at least six times as many holes as a cut thread tap. It also requires less power. All conditions being equal, the ground thread tap requires about one-fifth the sharpening for the same number of tapped holes and is less easily broken. It is possible to select cut thread taps that might tap holes within certain tolerances, but results are not so consistently uniform as with ground thread taps.

Opinion varies as to respective merits of high-speed steel and carbon steel taps, especially in small sizes. Many mechanics claim small high-speed steel taps break too easily as they are brittle and cannot be properly heat-treated. Hence, they use carbon steel taps. Until recently, there was no high-speed tapping equipment, but modern machines with high-speed tapping spindles make high-speed steel ground thread taps most economical, even in the smallest sizes.

Carbon steels taps are generally satisfactory for hand tapping operations, but there is the same relationship between them as between high-speed and carbon steel drills. High-speed steel taps remain sharp and hold their size longer than do those of carbon steel. To obtain full value from high-speed steel taps it is best to operate them at the highest practical speed.

Often the choice between carbon and high-speed steel taps is dependent upon ability to operate the tapping machine at sufficient speed to justify use of the more expensive high-speed steel taps. When maximum production and

RECOMMENDED TYPE OF TAP FOR VARIOUS CLASSES OF FITS

Class of Fit Required	*Class of Tap Recommended*
Class 1	A. Cut thread taps or commercial ground thread taps—All *NC* and *NF* pitches.
Class 2	A. Commercial ground thread taps—All *NC* and *NF* pitches.
Class 3	A. Precision ground, No. 1 tolerance taps—Sizes No. 0 to 12.
	B. Precision ground No. 2 tolerance taps—Sizes 1/4 to 7/8 in. diameter *NF* pitches.
	C. Commercial ground thread taps—Sizes 1 to 1 1/2 in. diameter *NF* pitches; 1/4 to 1 1/2 in. *NC* pitches.
Class 4	A. Precision ground, No. 01 or No. 1 tolerance taps—Sizes 1/4 to 1/2 in. *NC* and *NF* pitches.
	B. Sizes 9/16 in. and larger usually requires two tapping operations, with roughing and finishing taps.

NOTE: As tapping conditions and materials vary considerably, it is impossible to make specific recommendations; those shown above are general. Because of the variations possible in the material to be tapped, the type of machine used, methods of operation, etc., the size a tap will cut cannot be guaranteed.

SCREW THREAD FITS

Class	*Fit*	*Where Used*
1	Loose	Includes screw-thread work in which the threads must assemble readily. (Allowance is required)
2	Free	Includes most interchangeable screw-thread work, finished and semi-finished bolts and nuts, machine screws, etc. (No allowance required)
3	Medium	Includes highest grade of interchangeable screw-thread fit. (Smaller tolerances than Class 2)
4	Close	Includes screw-thread work requiring a fine, snug fit somewhat closer than Class 3. In this class fit, selective assembly of parts may be necessary.

THREAD SERIES AND IDENTIFICATION

Thread Series	*Identification*	*Recommended Use*
American National Coarse	NC	Recommended for general use in machine construction where conditions favorable to use of bolts, screws and other threaded components, where quick and easy assembly of parts is desired and for all work where conditions do not require the use of fine-pitch threads.
American National Fine	NF	Recommended for general use in automotive and aircraft work, and where special conditions require a fine thread.
American National Special	NS	All combinations of major diameters and pitches other than those given under *NC* and *NF* classification are identified as *NS*. Special threads of pitches finer than those of the *NF* series are used for various types of adjusting screws and internal and external threading of tubing and collars.

NOTE: Threads coarser than those of *NC* series serve no useful purpose and should be avoided.

low cost tools are essential, chucks and other tap holding devices have an important bearing on success of the operation. Often, special holders are necessary, but, when possible, these holders should be arranged to take standard stock taps.

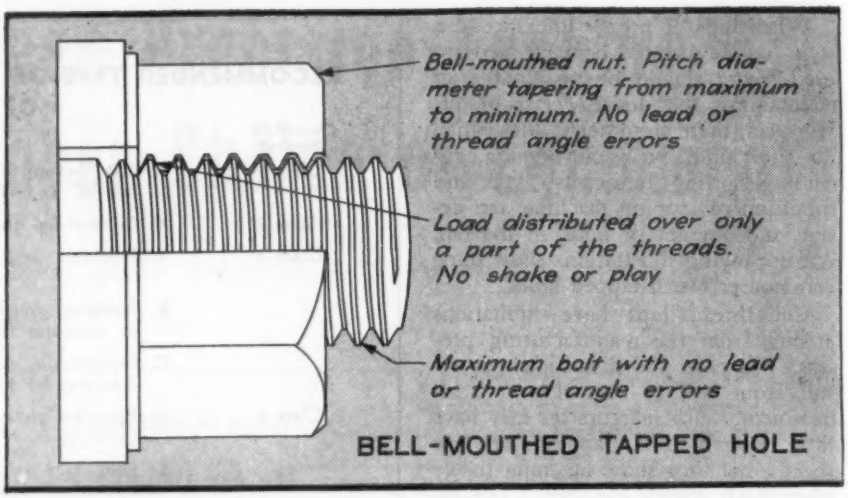
When special taps are required, there are many factors to be considered besides pitch and size. An increase in length may be desirable, or a different style of flute, width of land, amount of rake or hook or style of chamfer may be necessary. For many special operations, intelligent cooperation with the tap manufacturer may result in finding that standard taps can be used. There are, however, several styles and sizes of taps that do not lend themselves to high-speed production tapping. Sometimes a slight modification in width of land of standard taps, or in the amount of hook or chamfer, will eliminate tapping difficulties.

Relation of weight and size of tapping machine to size of work and size of tap has an influence on the tapping operation. Usually, a small, fast machine is recommended for light tapping, while a heavier machine generally will be more successful on large work. Where one machine is to be used with a variety of tap sizes, sufficient speed changes are needed in order that taps may be operated at optimum speeds.

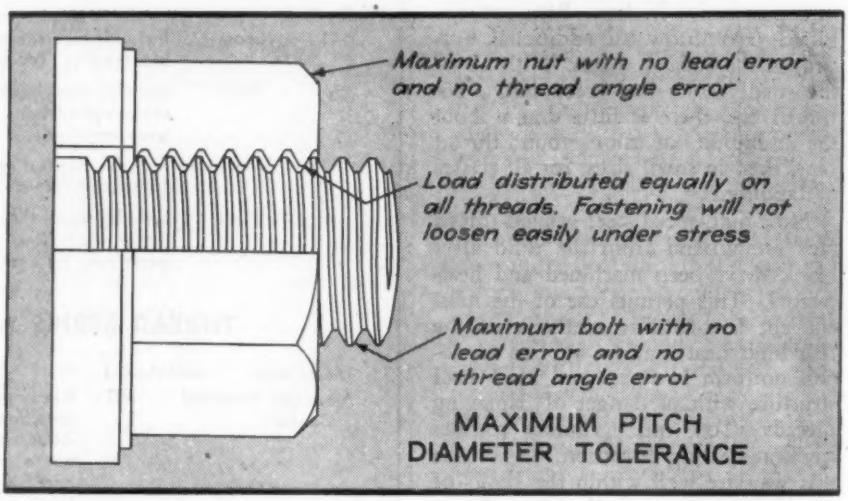
Of special importance is condition of the tapping machine when doing high-speed production tapping. Spindle bearings should be in good condition and the spindle should be properly aligned with the work table. The spindle must be free to traverse without undue effort, yet it must be fitted closely enough to eliminate vibration. The work table, or work holding device, must be in good condition. Tap reversing mechanism should be sensitive, to give instantaneous action.

Attention should be given to counterbalancing the tapping spindle. Added accessories, such as the tap holding chuck, friction drive mechanisms and tapping attachments, increase the spindle weight. While the difference in weight may not be sufficient to cause bad threads, a slight excess in weight may cause taps to cut oversize, due to burnishing of one flank of the thread while backing out. It also may result in loading of the tap in soft, springy metal, particularly low carbon steel and brass. If taps cut oversize for no apparent reason and show a tendency to load when used on a machine where tapping attachments or heavy chucks have been added, it is well to check balance of the spindle.

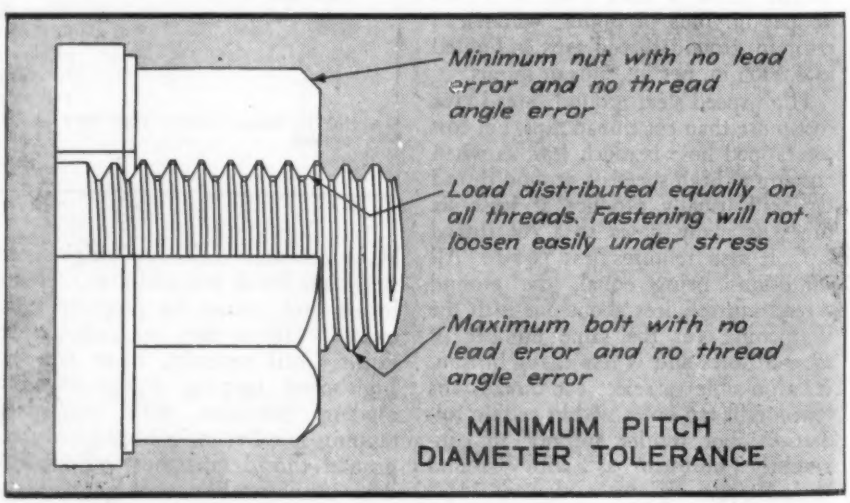
The next article in this series will appear in an early number.


Bell-mouthed nut. Pitch diameter tapering from maximum to minimum. No lead or thread angle errors
Load distributed over only a part of the threads. No shake or play
Maximum bolt with no lead or thread angle errors
BELL-MOUTHED TAPPED HOLE

Bell-mouthed tapped holes result when the tap does not run true, too much pressure is applied to the tap, tap lands are too narrow and when used in some floating chucks. Narrow lands will permit the tap to shave material from the sides of the first threads

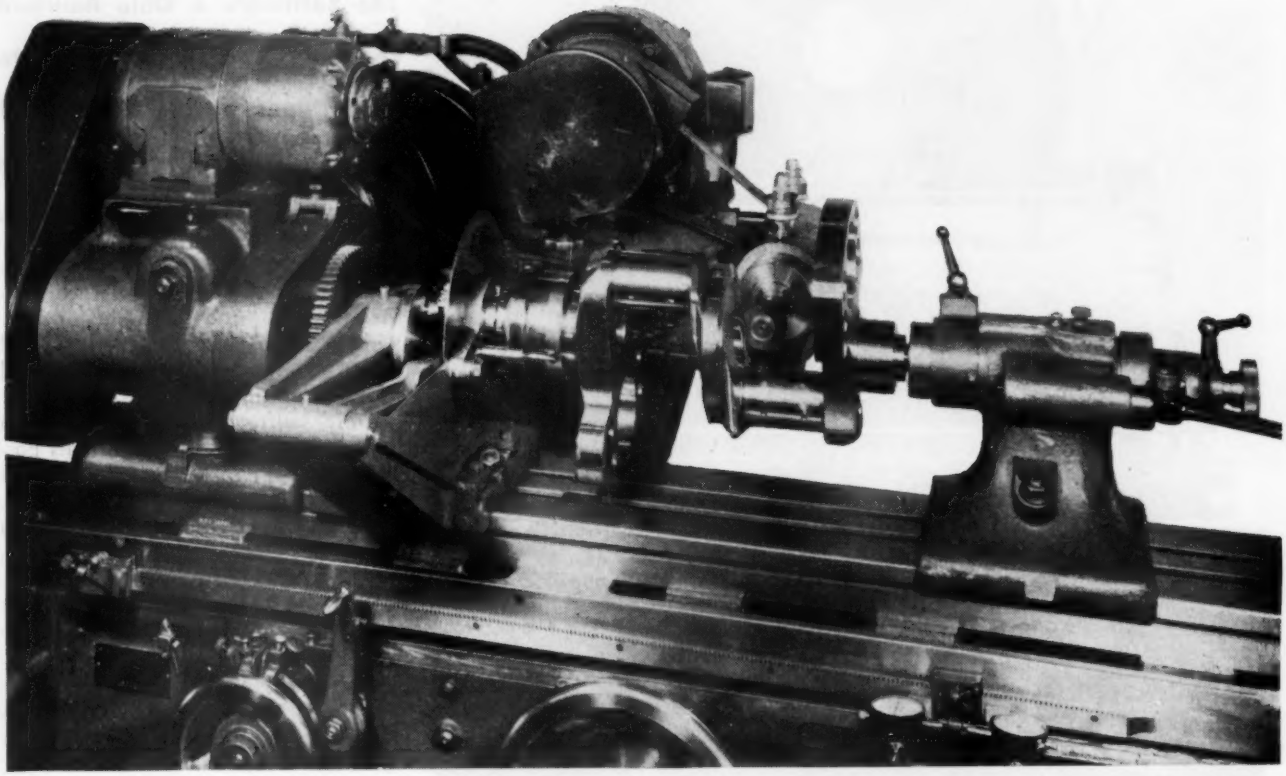

Maximum nut with no lead error and no thread angle error
Load distributed equally on all threads. Fastening will not loosen easily under stress
Maximum bolt with no lead error and no thread angle error
MAXIMUM PITCH DIAMETER TOLERANCE

When there are no lead or thread angle errors, metal-to-metal contact is obtained for the entire length of engagement, even when the nut is tapped to the maximum allowed pitch diameter


Minimum nut with no lead error and no thread angle error
Load distributed equally on all threads. Fastening will not loosen easily under stress
Maximum bolt with no lead error and no thread angle error
MINIMUM PITCH DIAMETER TOLERANCE

The ideal condition is obtained with a maximum bolt and a minimum nut, both made without lead or thread angle errors

Oscillating Work Drive Solves A Difficult Face-Grinding Problem



An eccentric embodied in the auxiliary headstock provides oscillation of the double-throw crankshaft in definite relationship to the crankpins. This controlled movement permits use of an internal grinding fixture to face grind both sides of the central web through a limited number of degrees.

A MANUFACTURER of airplane engines was recently confronted with the problem of face grinding a part that can be rotated less than a full revolution. The job consists of grinding the sides of the web between the crankpins of a double-throw crankshaft. Surfaces to be ground are approximately ¾ in. wide and extend through an arc of 225 deg., divided equally by a plane passing through the centerlines of the two crankpins.

Interference of the crankpins makes it impossible to rotate the work continuously as in ordinary shoulder grinding. Therefore, oscillating motion is secured by an auxiliary headstock devised by Brown & Sharpe Mfg. Co. This auxiliary headstock is driven by the regular headstock. A pinion mounted on the dead-center pulley drives a gear on the auxiliary headstock. This gear is fastened to a shaft, the other end of which mounts a faceplate incorporating an eccentric pin. Carried on this pin is a ball bearing that snugly engages a slot in the eccentric. The free end of the eccentric has a gear segment meshing with a gear on the spindle of the auxiliary headstock. Thus motion of the eccentric causes the auxiliary-headstock spindle to oscillate through an arc of 225 deg.

The front of the auxiliary-headstock spindle bears an arm with an adjustable workdriving pin. This pin engages one of two slots in the work driver, which is clamped rigidly to the hub of the work. Slots in the work driver are located 180 deg. apart and in definite relationship to the crankpins.

Grinding is done with an internal grinding fixture mounted on the wheelstand platen. Work is fed to the sheel by the handwheel for longitudinal table travel, and the stock removed from the sides of the web is controlled by two dial indicators. These are attached to the bed and are actuated by a dog on the machine table. A plate fastened to the bed straddles the dog, and prevents movement of the dog beyond the limit of movement for the indicator spindles.

When one side of the web has been ground, the work-driving pin is disengaged from the work driver, the wheel is run back, and the crankshaft is revolved 180 deg. The workdriving pin is then engaged with the second slot in the work driver, and the table is moved to position the wheel for grinding the other side of the web. So, in addition to providing the required oscillating movement, the auxiliary headstock makes it unnecessary to reverse the workpiece in the Brown & Sharpe No. 3 universal grinder which was selected for the face-grinding operation.

Locomotives

The Baltimore & Ohio Railroad changes 2-8-2 locomotives to 4-8-2 types having 20 percent greater power. Increased tank capacity permits non-stop runs

AMERICAN RAILROADS are now handling the largest volume of traffic in their history. And this is being done with 9,500 fewer locomotives and 500,000 less freight cars than they had in service during the last war.

Only swift and steady increase in operating efficiency has made this possible. In 1921 each serviceable freight car traveled an average of 25.8 miles a day. This increased to 43.7 miles a day in 1941. The average freight train in 1921 consisted of 37.4 cars, carrying 651 tons of freight, while in 1941 the average cars per train increased to 50.3 and the average tonnage to 951. The average freight train speed in 1921 was 11½ miles an hour. This was increased to 16½ miles an hour in 1941.

Increased efficiency represents the

Twenty Mikado-type locomotives are being changed to Mountain type by the Baltimore & Ohio. Increased cylinder diameter, driving wheel diameter and boiler capacity gives 20 percent added tractive power

Rebuilt to Meet Traffic Demands

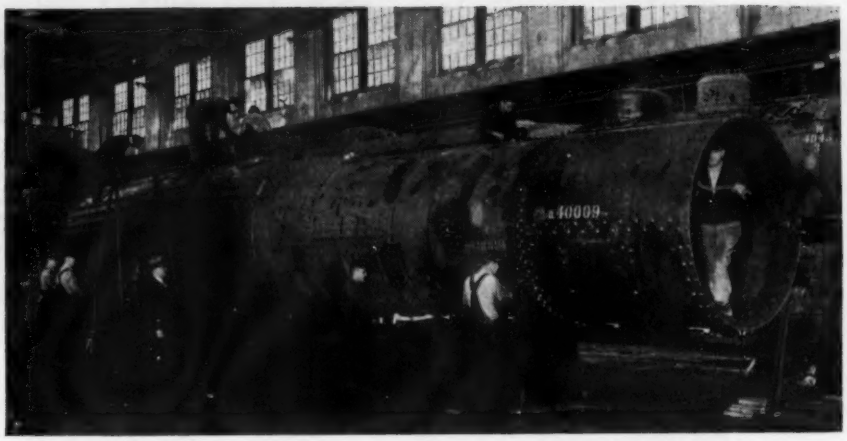
use of more powerful and efficient locomotives, as well as improved and larger capacity rolling stock. Between 1929 and the outbreak of the war, there was a surplus of locomotives; therefore, the older ones were scrapped. Only the more efficient were retained —big ones that could haul the most cars and the heaviest loads. Many railroads kept some of their older locomotives in reserve, since they were basically good, and capable of being modernized and improved.

In spite of the new locomotives placed in service, increased transportation requirements as a result of the war placed an unprecedented demand on the railroads for still more motive power. Yet in 1942, the War Production Board permitted the Baltimore & Ohio Railroad to take delivery of only nine of 23 new locomotives ordered—there was more urgent need for the steel. But more motive power had to be obtained. Modernization of older locomotives was the answer.

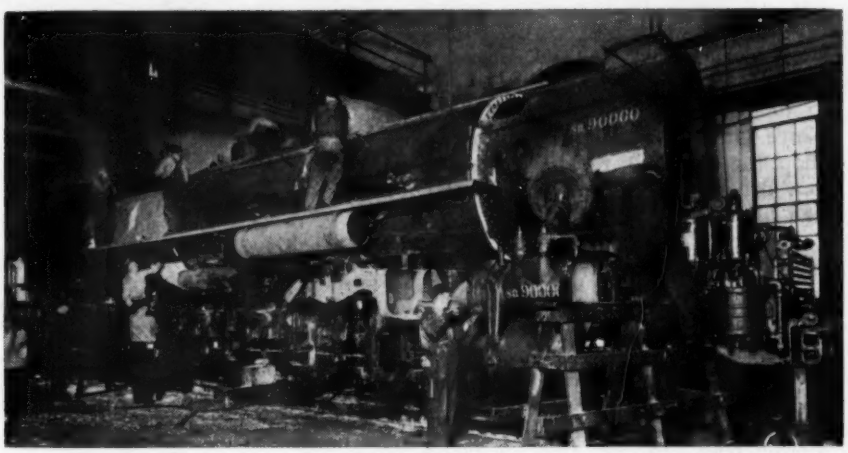
The Baltimore & Ohio was using 2-8-2 and 2-6-2 locomotives on the Chicago Division for handling all important freight trains. By increasing the capacity of one of the latter type engines and adding an auxiliary water tank, increasing the coal capacity from 17½ to 32 tons, and water from 12,000 to 29,000 gal., it was possible to eliminate coal and water stops between division points and decrease the running time.

But this alone did not solve the problem. Something had to be done about the 2-8-2 locomotives, built in 1920 and 1923. As average speeds and tonnage ratings increased, these locomotives had to work harder and faster, and maintenance costs went up, because of the need of more frequent running and heavy repairs.

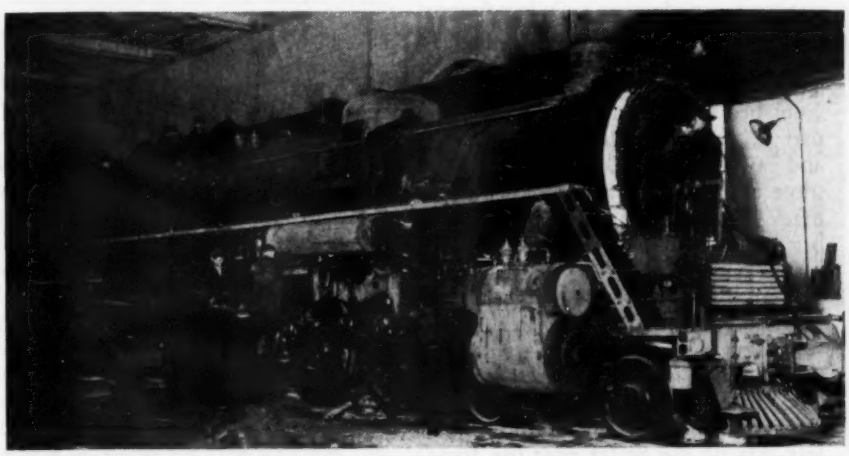
In an attempt to find a solution for the high maintenance costs, one of these locomotives was modernized by reboring the cylinders to 26½ in. diameter, increasing the boiler pressure from 220 to 240 lb. per sq. in., and by substituting 70 in. driving wheels for those of 64 in. diameter. Tractive effort of the locomotive was increased from 63,200 to 65,500 lb. Oil lubrication was provided for all driving journals, and a lateral cushioning device was applied to the rear driving wheels to enable the engine to



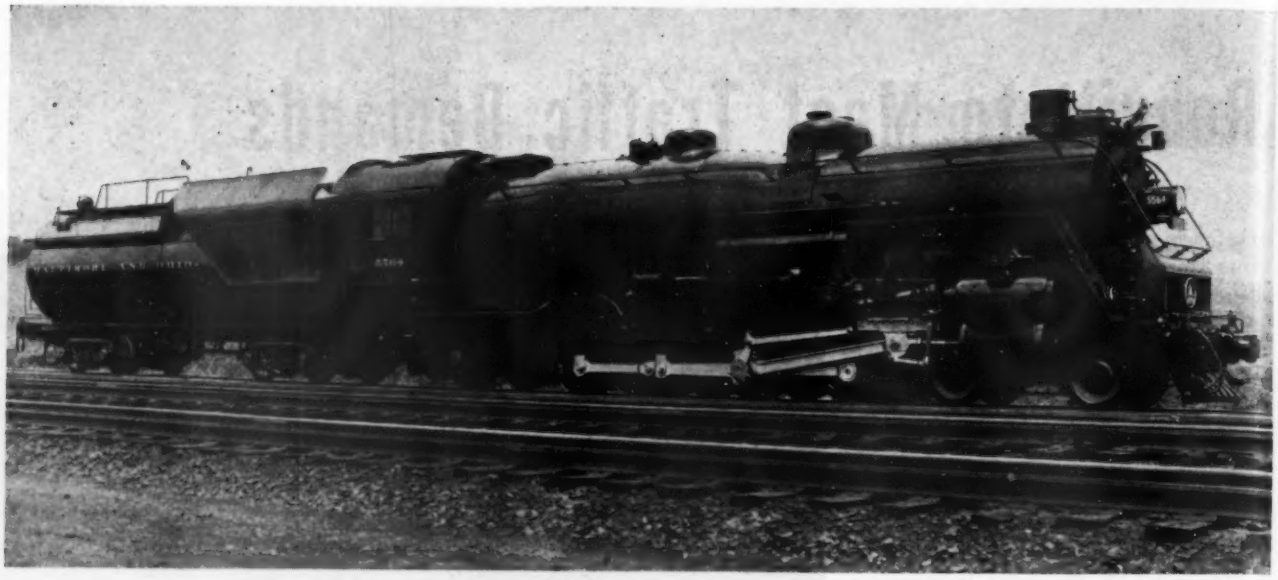
One course has been added to the boiler shell, providing for a combustion chamber and additional heating surface



The main frame of each modernized locomotive is a one-piece steel casting, including the frame, cylinders, headlog and air-pump brackets



Each 4-8-2 locomotive is equipped with the latest types of boiler and running gear accessories to improve operating efficiency



Several of the modernized locomotives have roller bearings on all truck and driving wheel journals. Water and coal carrying capacity have been increased to permit long non-stop runs

negotiate curves more easily. With larger tender and auxiliary tanks, this locomotive was subjected to exhaustive road tests with a dynamometer car. Results showed increased speed, greater efficiency, and lower maintenance costs; therefore, it was decided to modernize additional locomotives. Three more locomotives, awaiting shop for first-class repairs, including new driving wheels, frames, cylinders and fireboxes, were first rebuilt.

Twenty more locomotives are currently being modernized. These were built in 1911-1913 and were due for extensive repairs. But instead of replacing wheels, cylinders, frames and other parts with new ones of the same kind or design, these 20 are a still greater improvement on the four previously built. In fact, they are being changed in type, from 2-8-2 wheel arrangement to 4-8-2 mountain type.

In addition to the four-wheel leading truck, the changes include a firebox combustion chamber to provide additional heating surface, which necessitated lengthening the boiler shell; front bed section with cylinders, front part of the frame, the headlog casting and air-pump brackets cast in one piece to eliminate cylinder, frame and brack bolts; Baker valve gear; oil lubrication on all journals; lateral cushioning device on the rear drivers; stoker; power reverse gear; mechanical lubricator; and superheater with rolled-in units. An open-type feedwater heater is located in the smokebox, with a cold-water pump under the cab and a hot-water pump on the left side of the boiler near the front. The enlarged tender, with an auxiliary water tank, carries 26 tons of coal and 27,500 gal. of water. Half of these locomotives will have a complete engine bed cast in one piece, including cylinders, frames and all cross braces and cradle frame.

The rebuilt locomotives compare with the original as follows:

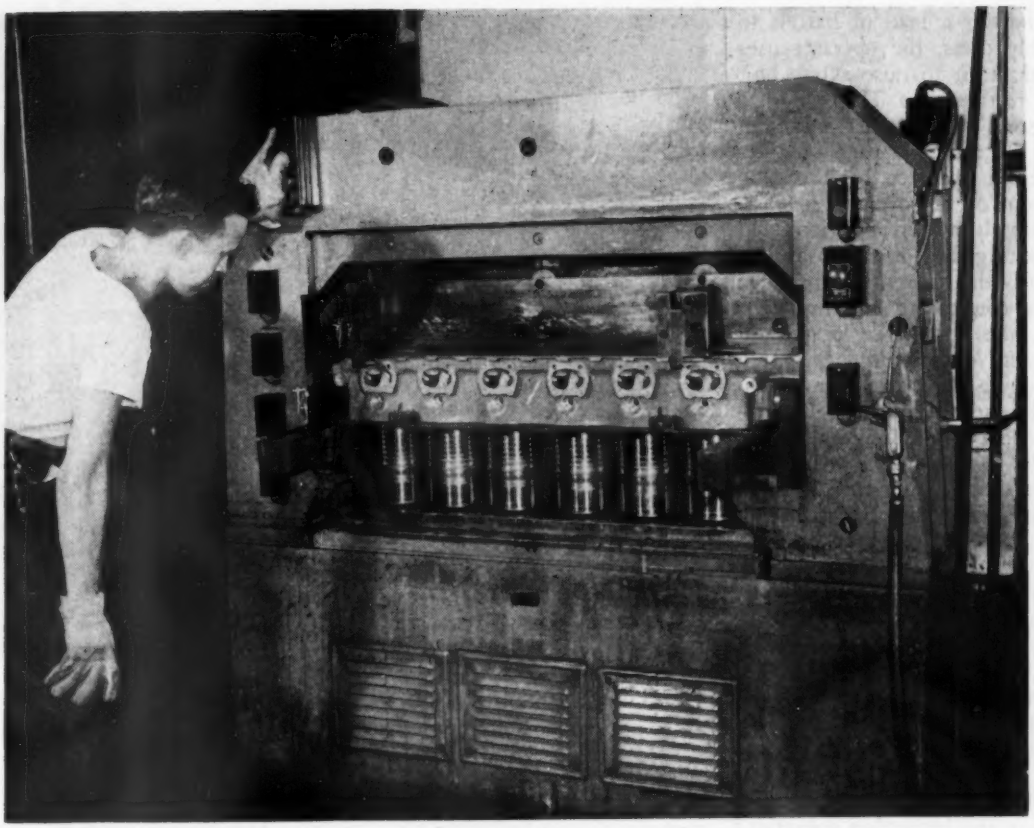
	Original	Rebuilt
Type	2-8-2	4-8-2
Cylinders, in.	26x32	27x32
Steam pressure, lb. per sq. in.	190	230
Driving wheel diameter, in.	64	70
Weight on drivers, lb.	223,600	255,000
Tractive effort, lb.	54,000	65,100
Cylinder horsepower	2,128	2,990
Coal consumption, lb. per 1000 train miles	78.4	65.7

With the exception of the first two locomotives modernized, all frames are designed so that roller bearings may be applied at any time to the driving wheels. One locomotive has been so equipped, and will undergo road tests with a dynamometer car to compare operating results with the rebuilt Mountain-type engines equipped with friction bearings. The engine trucks are equipped with SKF roller bearings, while the drivers, trailer truck and tender trucks have Timken roller bearings. Based on past performance, these are expected to decrease starting resistance, improve fuel economy, reduce running effort, reduce maintenance costs, and increase availability.

All things considered, the modernized locomotives are 20 percent more efficient. When the War Production Board permitted the delivery of but nine locomotives from an order for 23, these 20 steam locomotives were built with a minimum use of much needed steel. Six are already in service.

High Speed Milling

IT DOESN'T PAY to go off half-cocked when new developments appear. While the fantastically high milling and turning speeds which have become common practice in some cases might seem to spell the doom of all old lathes and milling machines, it's a bit early to worry about it. Undoubtedly some shops on high production work will demand machines that will cut aluminum at 20,000 surface feet per minute, and steel at 1000 feet or better. But this will not scrap all present machines in the average shop. For surveys show that comparatively few shops are now running their present machines at the upper limit. More than speed has to be considered. Cutters must be designed for the job and properly ground. Work handling fixtures must be redesigned greatly to reduce the time between cuts, or the extra amount of work turned out may not warrant the increased cost of cutters and the power required. Then, too, chip disposal may easily become a real factor. This does not mean that we are going to be satisfied with old methods. But we must study high-speed machining to benefit by it.



Assembly of cylinder barrels into head castings for the Allison engine is accomplished in one of these special presses after the castings have been heated at about 480 F., and the steel barrels have been refrigerated

Shrink-Fit Assembly of Cylinders Is Done on a Special Press

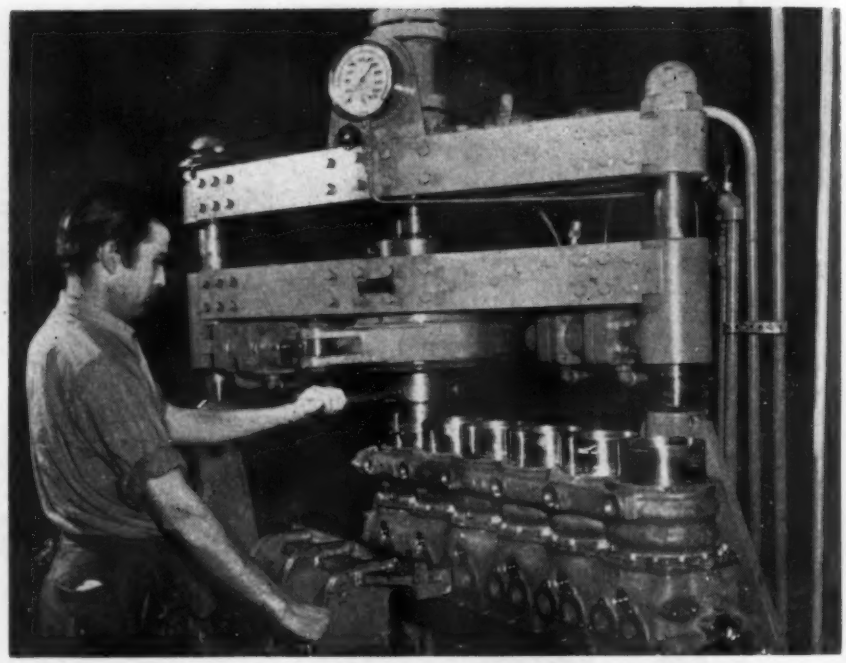
Uniform results in assembly of Allison cylinder banks arises from use of a hydraulic press that simultaneously pushes six refrigerated steel barrels into a heated aluminum head casting

PRODUCTION ENGINEERS at the plant of the Allison Division, General Motors Corporation, have devised a special press for the assembly of steel cylinder barrels in aluminum head castings. The press is set up at the end of an electric oven. This makes it possible to press the six cylinder barrels for each bank into a head casting immediately after the casting is removed from the oven, before it has a chance to cool. The fit between each barrel and the head casting is a straight shrink-fit, not a threaded shrink-fit as is the case when cylinder barrels are assembled to the individual head castings for most radial aircraft engines.

Each cylinder head casting is placed on a steel plate carrier, having positioning pads for proper alignment of the casting above the six cylinder barrels when the assembly operation is performed. These plates are cut away to provide clearance for the cylinder barrels. The casting, on its carrier, is pushed through the oven on rails by an air cylinder which moves the line of casting about 15 in. on each furnace cycle. Six castings are in the oven all the time when the unit is working to capacity. During the 7 min. oven cycle, the operator positions six cylinder barrels and presses them into the head casting previously moved out of the furnace, then removes the assembly to a conveyor before the next casting is pushed out of the oven. While in the oven, the cylinder head castings are heated to about 470-490 F. under automatic control.

Meanwhile, machined cylinder barrels are cooled to about —40 to —50 F. in a four-compartment refrigerating unit. Each compartment has a tray holding six cylinder barrels. When

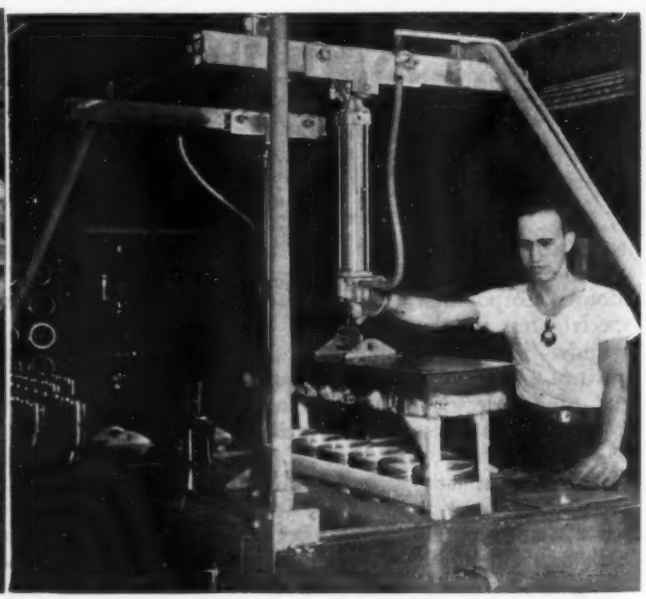
ready to transfer a load of barrels to the assembly press, the operator uses a pneumatic hoist to raise a tray unit from the refrigerator. The cylinders are transferred to cups in the bottom bolster of the assembly press just before a heated cylinder head casting is moved out of the oven. When the cylinder barrels are in position, and a head casting has been positioned above them, the operator actuates a pushbutton controlling the hydraulic circuit to raise a plunger located directly under each cylinder barrel, thereby forcing the barrels into position in the heated casting. The assembly is held in this position until the barrels have expanded and the casting has shrunk sufficiently to hold the barrel rigidly in position. It is estimated that the head casting expands about 0.028 in. at the fit diameter for each barrel, while each barrel is contracted about 0.005 in. in diameter at —50 F. Since there is an interference of 0.018 to 0.023 in. between these diameters when the parts are cold, there is ample clearance between the parts at the temperature used.



This Logan nut tightening machine insures the locknut on each cylinder barrel being pulled into place to a predetermined torque

After assemblies cool, and a number of fitting and inspection operations have been performed, a cast aluminum-alloy coolant jacket casting is assembled over the cylinder barrels and securely bolted to the head casting. Next, spanner nuts are fitted over the barrels to lock them in place in the jacket casting. To prevent undue strain on the assembly, and to insure all spanner nuts being tight, they are tightened with 2,100 ft.-lb. torque in a special Logan hydraulic nut tightening machine developed for this operation. In this unit, a cylindrical spanner wrench is carried by a vertical shaft on the end of a hydraulic cylinder which is moved down over the cylinder barrel when properly centered under the wrench. Another hydraulic cylinder then operates a ratchet drive to turn the wrench until the proper torque has been developed. The wrench head is aligned by hand as it is brought down over a nut. A specific sequence has been worked out for tightening the nuts so as to minimize distortion of the assembly. Automatic relief valves operate when a nut has been tightened properly so it is impossible to pull a nut too tight if the relief valves are kept properly adjusted.

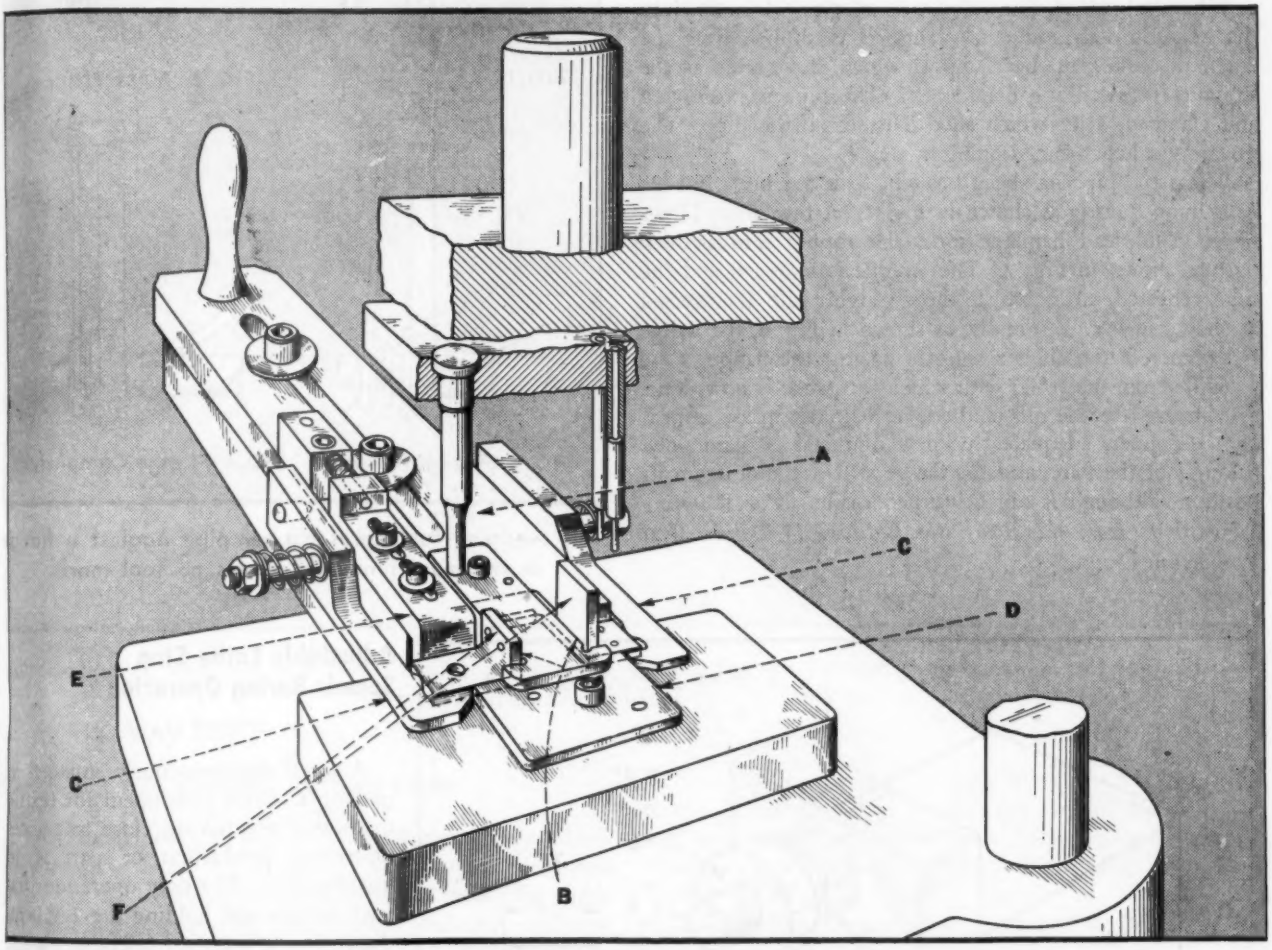
Refrigerated cylinder barrels are transferred by hand to cups in the bottom platen of the assembly press. Under each cup is an individually-operated hydraulic plunger to raise barrel into head casting



Cylinder barrels are refrigerated in a unit having trays holding six barrels each. When ready to transfer a set of barrels to the assembly press, a tray is raised out of the refrigerator with an air hoist

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meretorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



This tandem die for punching holes in angle plate has a compensating slide that positions the holes accurately regardless of variations in angle length

Tandem Die for Piercing Angle Plates

BY E. H. GIRARDOT
General Electric Company

The drawing shows a tandem die for piercing holes in angles. It was essential that all the holes be located in relation to one side of the angle; therefore, the compensating slide feed shown was designed to maintain the desired relationship of the holes even when the angles varied in length.

The short leg of angle *F* is loaded on the left-hand side of slide *A*, being gripped and held against locating surface *B* by action of spring lever *C*. The part is fed to positive stop *D*, pierced, and then returned to loading position by the hook on the end of spring lever *C*. Part *F* is then reloaded in the right-hand side of the slide, care being taken to retain the same locating end of the angle. A second angle is then loaded in the left-hand side for the first operation.

The slide now locates the angle of the left-hand side by positive pressure against the part, forcing it securely against positive stop *D*. Variation in the length of the part on the right-hand side is accommodated by action of the spring-actuated push-bar *E*, which forces that part against stop *D* regardless of the length of the part. Slide feeds of this type are ideal from the safety viewpoint, since all loading of the die occurs outside the die proper.

Swedging Tool Flares Large Copper Pipe

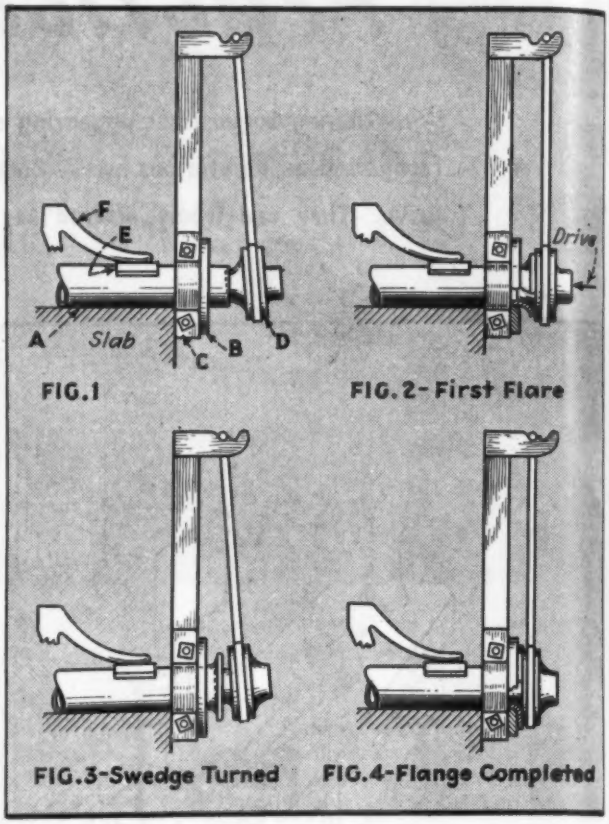
BY W. A. SPINDLER
Kaiser Company, Incorporated

The device shown in the drawing was designed as a rapid means of forming large copper pipe around a steel flange. Prior to its use, the pipe was secured to a bending slab and after the flange was slipped over one end the pipe was heated and flanged with a wooden maul. Heating and pounding were repeated a number of times until the copper was flared around the flange and flattened against it.

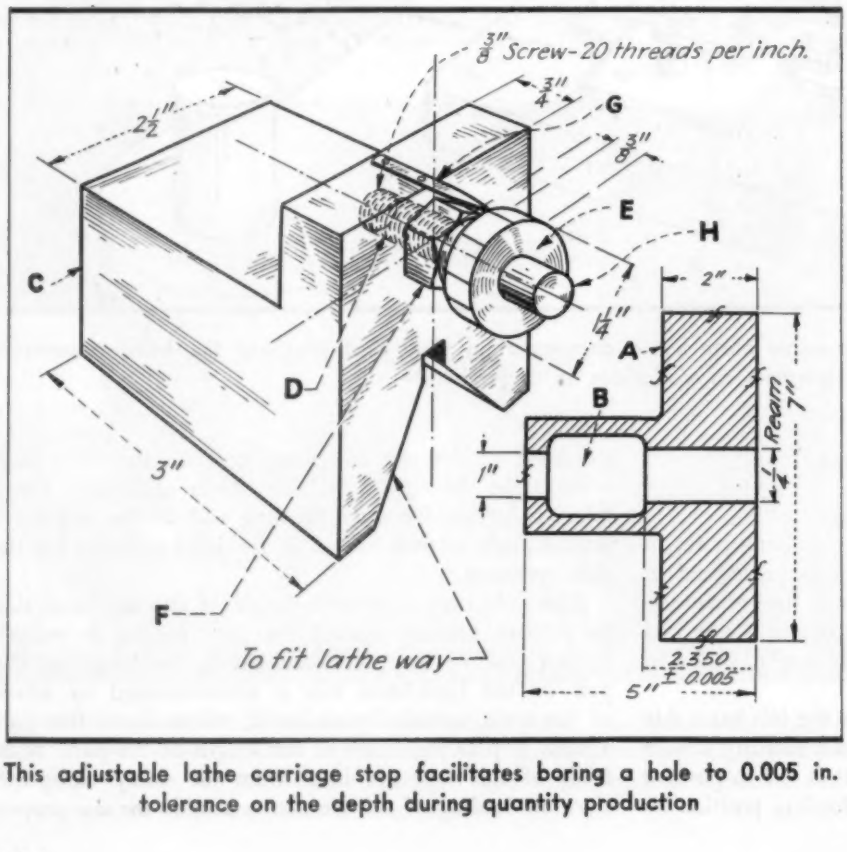
When using the illustrated device, pipe *A* is fixed to the bending slab and steel flange *B* is slipped over the end and backed up by clamp *C* which also serves as the support for swedging hammer *D*. The pipe is positioned and clamped, after which shoe *E* is set on the pipe. The assembly is kept from slipping by dog *F*.

When the pipe has been brought to a red heat, swedge *D* is hung quickly as shown in Fig. 1. A few heavy blows of an 8-lb. lead hammer force the copper into a thick flare as shown in Fig. 2. The swedge is removed and the pipe reheated, after which the swedging die is reversed as shown in Fig. 3. Finally, as shown in Fig. 4, the flange is hammered until it is a snug fit against the flange.

Aside from the speed with which this work is now done, as compared to the old method, no hammer marks appear on the copper, adequate thickness of metal is maintained throughout the flare, and the flange will not slide from its position, although it can be turned easily. *War Winning Suggestions from the Board for Individual Awards, War Production Drive.*



This swedging tool flares copper pipe against a flange in minimum time and leaves no tool marks



This adjustable lathe carriage stop facilitates boring a hole to 0.005 in. tolerance on the depth during quantity production

Adjustable Lathe Stop Speeds Boring Operation

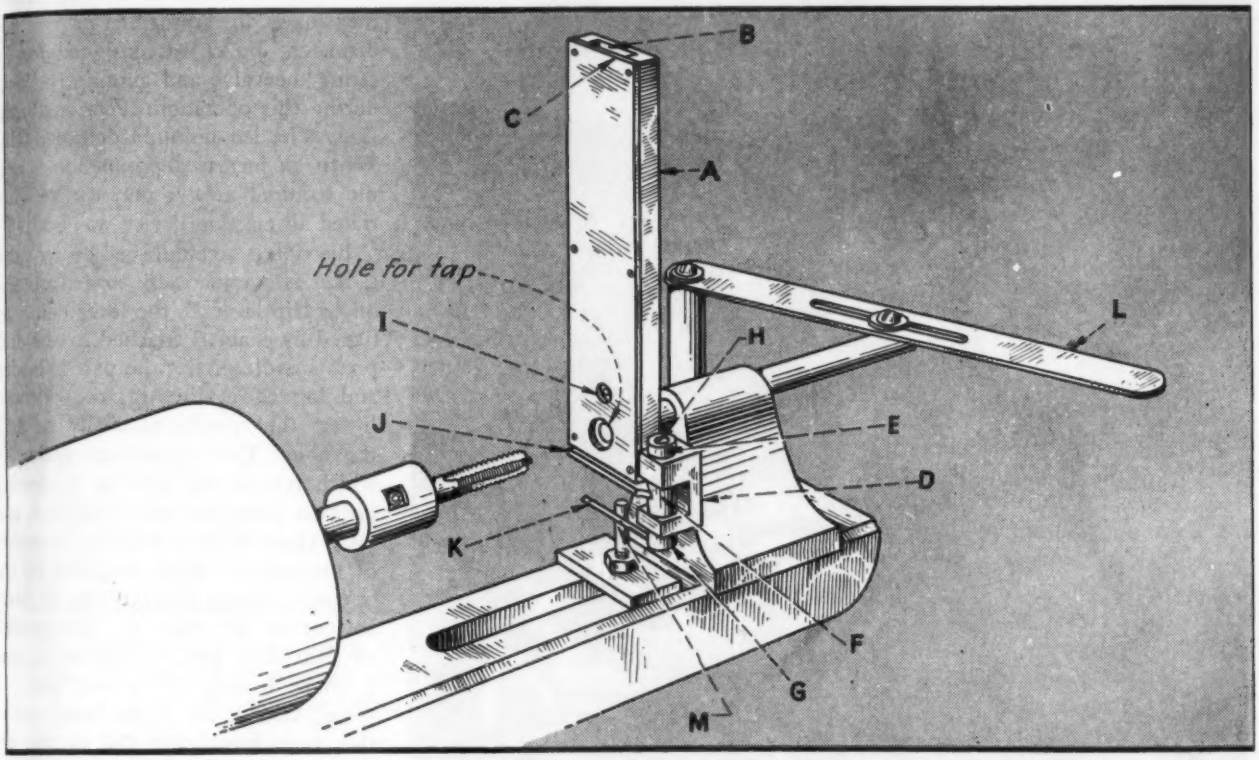
BY ROBERT MAWSON

A small shop previously engaged in making a simple attachment for textile machinery not having close tolerances undertook production of part *A* in quantity lots. The only operation that gave trouble was holding the 2.350 in. dimension to specified tolerances while boring hole *B*. Mechanics lost much time in keeping the part to size, because it was difficult to measure the depth of the 2.350 in. hole through the 1 in. hole. A hook gage was first used, but the need for faster production required a lathe carriage stop.

This stop, shown in the drawing, is comprised of base *C*, screw *D*, graduated colar *E*, jam nut *F*, and pointer *G*. Base *C* is hardened and ground to fit the front lathe way to which it can be fastened with an ordinary clamp. Screw *D* has 20 threads per inch so that one revolution advances or retracts it 0.050 in. Collar *E* is keyed and doweled to the screw, and is scribed

with ten equally spaced graduations around the circumference. Pointer *G* permits accurate setting of stop *H* at 0.005 in. intervals by turning the collar from one graduation to the next.

When setting up for production work, the 7 in. diameter of part *A* is first turned and faced, and is then mounted in the chuck with the face flush against the jaws. The 1 in. hole is drilled and hole *B* bored to size and depth holding the 2.350 in. dimension to the required tolerances. The stop is then clamped to the front lathe way, and then adjusted and locked to hold the dimension on all subsequent castings.



This magazine feed has trip levers that automatically eject a tapped nut and drop a new nut to tapping position each time the tailstock ram is retracted

Feed Magazine Built for Tapping Lathe

BY S. J. GANCHER

The magazine feed shown in the drawing was added to a tapping lathe for salvaging 30,000 thin hexagonal nuts that had been tapped with special threads, the order for which was cancelled. Fortunately, the root diameter of the threads was such that without redrilling, a ⅛ in. straight pipe tap, the required size for salvaging, could be run through the nuts, leaving a good thread.

The job was started by chucking the tap in the lathe and holding each nut in a wrench while running the threads. This proved slow and uneconomical; consequently, some means of automatically feeding the nuts had to be devised. Each nut had to be tapped singly, because the tapping lathe equipped with leather friction clutch disks did not have enough power to drive the tap through more than one nut at a time, and it was the only machine available. This, however, did not prove too great a handicap once the automatic feeding arrangement was devised.

The nuts are loaded in magazine *A* through slot *B*, the magazine being milled from a length of flat stock and fitted with cover plate *C* and attached to the tailstock ram. Bracket *D* is welded to the magazine and fitted with collars *E*, *F* and *G* on shaft *H*. Bent arm *I* is welded to collar *E*, and is shaped to pass through the back of the magazine and hold the unworked nuts from dropping through when work-release lever *J* is in open position. Trip lever *K* is welded to collar *G*.

With the trip arrangement positioned as shown in the drawing, the tailstock ram is advanced to the tap by pulling lever *L*. A nut is tapped and the tailstock ram is retracted. When trip lever *K* hits pin *M*, work-release lever *J* is swung to open position, dropping the threaded nut through the magazine. Simultaneously, bent arm *I* engages the bottom nut in the magazine. As the tailstock ram and magazine are again advanced, the trip arm swings back to working position, being actuated by a torsion spring. This pulls arm *I* back, throws lever *J* beneath the magazine slot, and the stock of nuts drop with the bottom nut in position for tapping. The tapping, unloading and loading cycle is then repeated.

To avoid unnecessary calculations and to compensate for errors in assembly of the trip arrangement, collars *E*, *F* and *G* were temporarily fastened with setscrews. After the three levers were timed by making the necessary adjustments to each lever, the collars were pinned to the shaft.

Unloading this drill jig automatically by compressed air decreases operator fatigue and increases production 74 percent

Air Valve Ejects Parts From Drill Jig

BY CLYDE C. McKINLEY
Caterpillar Tractor Co.

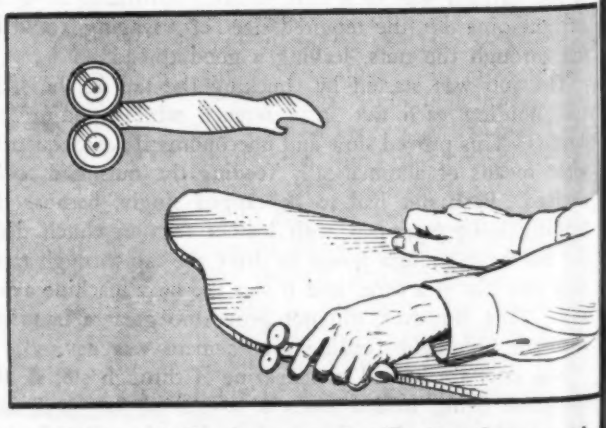
After hollow-stemmed valves *A* are machined as shown in the illustration, they have to be drilled across the diameter. Jig *B* was designed for locating the valve and guiding the drill during this operation. Previously, the jig was loaded and unloaded manually. When an increased production schedule required greater output, the illustrated air-ejection device was built.

Ejection is accomplished by air valve *C* that is automatically turned on and off by trip lever *D*, the lever being actuated by chain *E* attached to the drill press spindle. After the part is loaded and located in the jig, the operator lowers the spindle manually to drill the hole. This compresses spring *F*, which returns the spindle to starting position when the hole is drilled, and pulls chain *E* taut. Further retraction of the spindle, done manually by the operator, rotates trip *D* about its pivot and opens air valve *C*. Compressed air then blows part *A* from the jig into a chute leading to a tote pan. A spring-loaded gate on the lower end of the chute breaks the fall of the finished part before it enters the tote box, thus preventing it from becoming nicked or burred. While one valve is being drilled, the operator secures and holds the next valve in readiness, which he loads in the jig as soon as the drilled valve is ejected. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

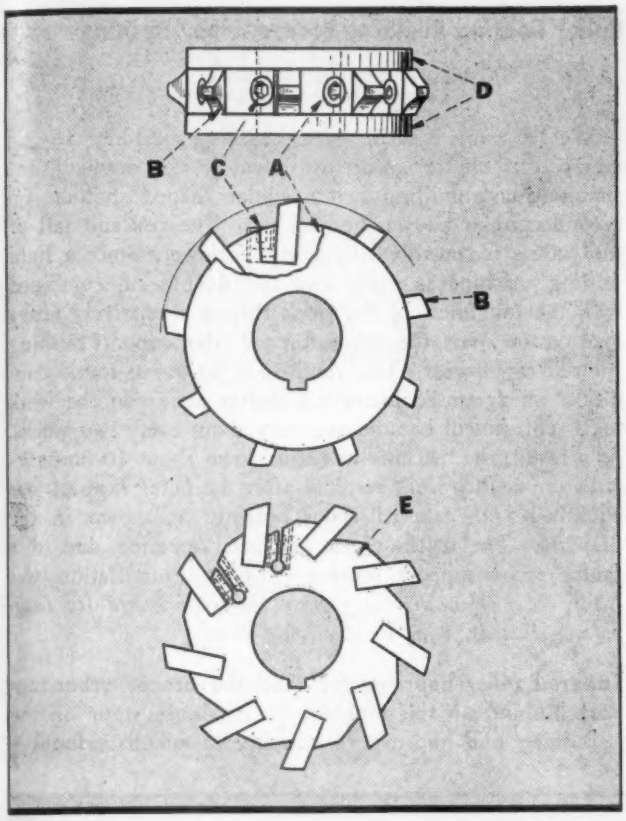
Knife Sharpener Removes Templet Burrs

BY C. F. FITZ

Our shop makes a large variety and number of templets for cams, form tools, dies, press tools and sheet-metal routing. Considerable production time is required to remove burrs from the edges of the templets after they have been cut out, filed and stoned to the layout line. Normally, these burrs are removed by filing—a slow and arduous procedure. A roller-type knife sharpener, such as shown in the drawing, does this job more effectively and in minimum time. The rollers are drawn along the edge of the templet, applying light pressure, and removes the fine burrs from both edges of the sheet in a single pass of the tool. The tool is held diagonally to the templet, cutting on the two outer edges of the rollers.



A roller-type knife sharpener is effective for removing fine burrs from the finished edges of templets



This inserted-tooth form milling cutter was used to hob screw threads and gear teeth when standard form cutters were not obtainable

Form Cutter Made With Inserted Teeth

BY R. A. SCHULTZ
Woodville, South Australia

We have been using the form cutter shown in the drawing for hobbing screw threads and gear teeth. It consists of body *A* of suitable width, which is bored and milled with a keyway for fitting a milling machine arbor. The body is slotted to take teeth *B*, which are locked in the body by lockscrews *C*.

The inserted teeth are first cut to rough size with a hacksaw and finished to a few thousandths less than the width of the body. One end of the teeth are cut square, while the length is left to a rough dimension. Two parallel plates *D* are screwed to each side of body *A*, the teeth being a sliding fit between them.

The teeth are formed by clamping them in dummy body *E*, the slots in which are slightly off center to give the correct form relief. This body is then mounted on a mandrel, chucked between centers in a lathe, and the desired form cut on the teeth with the aid of a templet.

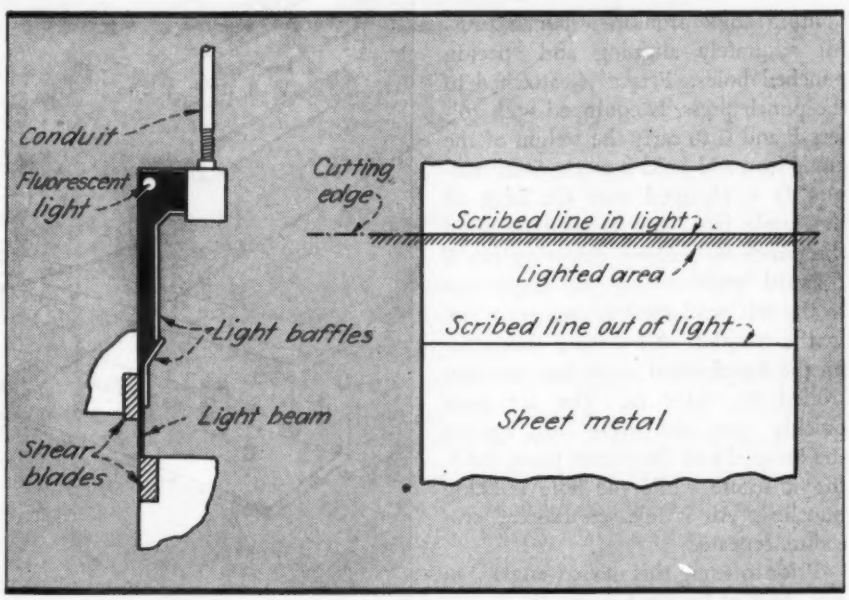
The teeth in these cutters can be sharpened in the conventional manner. Spare teeth can be prepared and kept on hand when production requirements demand it. This illustrated type of cutter, used for hobbing screw threads and gear teeth, has a longer body and more holding screws than standard form milling cutters, but it has worked satisfactorily; as a matter of fact, it is the only type we have used, since standard cutters were not obtainable. We have made up several bodies, and have used different shapes of teeth as various jobs came up.

Guide Light on Shears Speeds Production

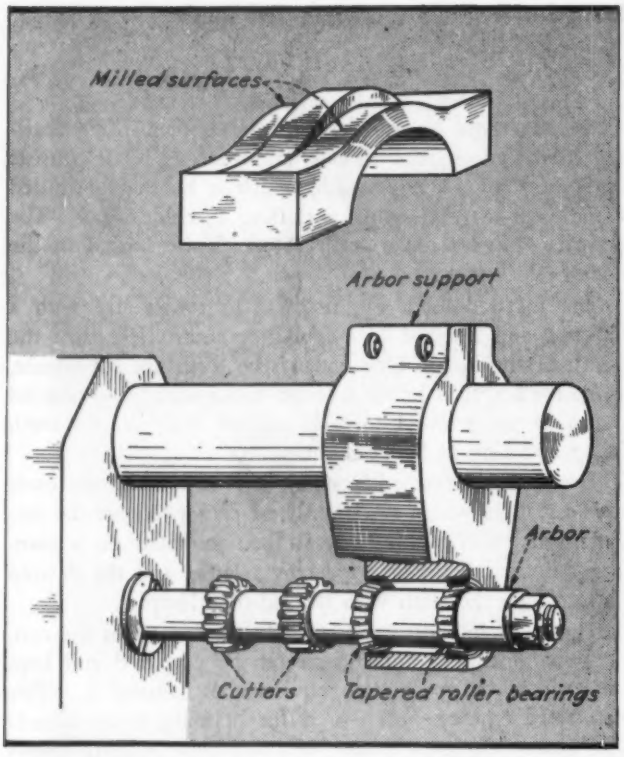
BY GEORGE E. OLIVER
Marinship Corporation

The drawing shows a fluorescent light encased in a metal tube which is secured to the top edge of a shear frame. The light passes down through the enclosed shield and forms a thin line of light which falls exactly on the shear line. Therefore, when a piece of metal is placed in the shear, the scribed line will light up brilliantly, thus enabling the operator to ascertain exactly where to place the scribed line for making the cut.

Prior to equipping the shear with this light, it was necessary to set up a gage back of the shear blade to insure the proper cut, or to set the metal on the shear line by trial and error. In some instances, a sample shear cut of scrap metal was made. The light-equipped shears does not require the use of a gage, and eliminates trial-and-error work. It is estimated that metal can be sheared in half the time formerly required. Furthermore, set-up time has been entirely eliminated. This device increases production about 60 percent. *War Winning Suggestion from thhe Board for Individual Awards, War Production Drive.*



A light beam from a fluorescent lamp thrown on the scribed line permits accurate location of sheet metal beneath shear blades



Roller Bearing Replaces Bronze Arbor Bushing

BY RAYMOND HULSE
Packard Motor Car Company

We are using a small vertical milling machine carrying two cutters on the arbor, as shown in the drawing, for simultaneously milling two irregular shaped shulders on a connecting rod lower bearing cap. The rise and fall of the cutters is controlled by a cam follower. Since a light milling machine is used, and the double cut combined with the toughness of the stock throws a relatively heavy load on the arbor, the regular bronze arbor-support bushing showed rapid wear. This resulted in an out-of-round condition which caused increasing chatter marks on the work until replacement became necessary about every two weeks. As a result, the machine was shut down about 10 hours.

Better quality work resulted after the outer support was equipped with tapered roller bearings as shown in the drawing. The machine has not been repaired due to a faulty arbor support bearing since this installation was made. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Tapered roller bearings replaced the bronze arbor-support bushing on this machine to eliminate wear on the bushing and improve the quality of milled surfaces

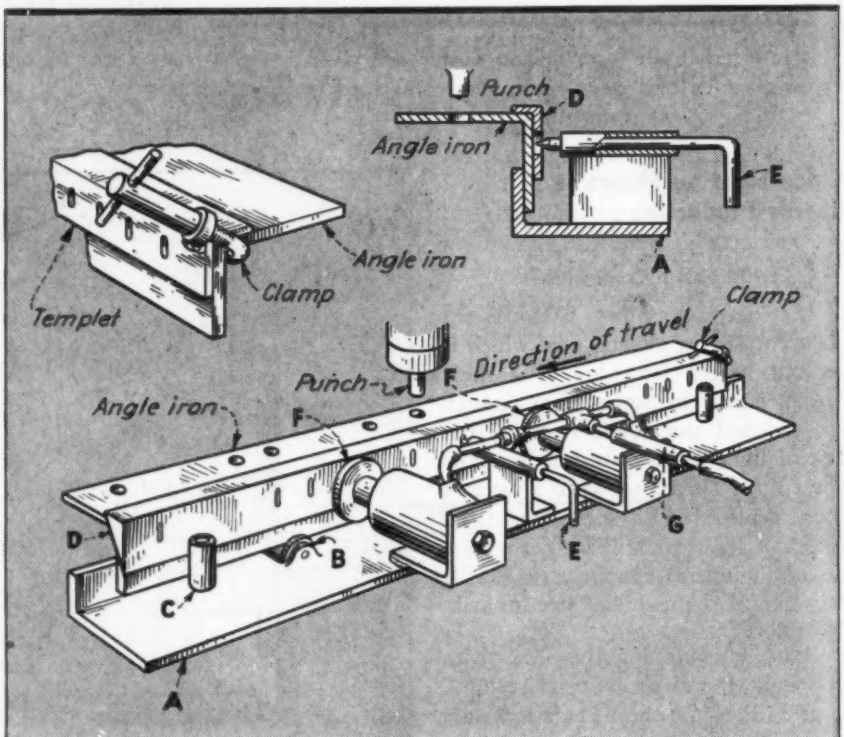
Press Jig Spaces Holes In Angle Iron

BY HENRY J. CLAVERIE
Oregon Shipbuilding Corporation

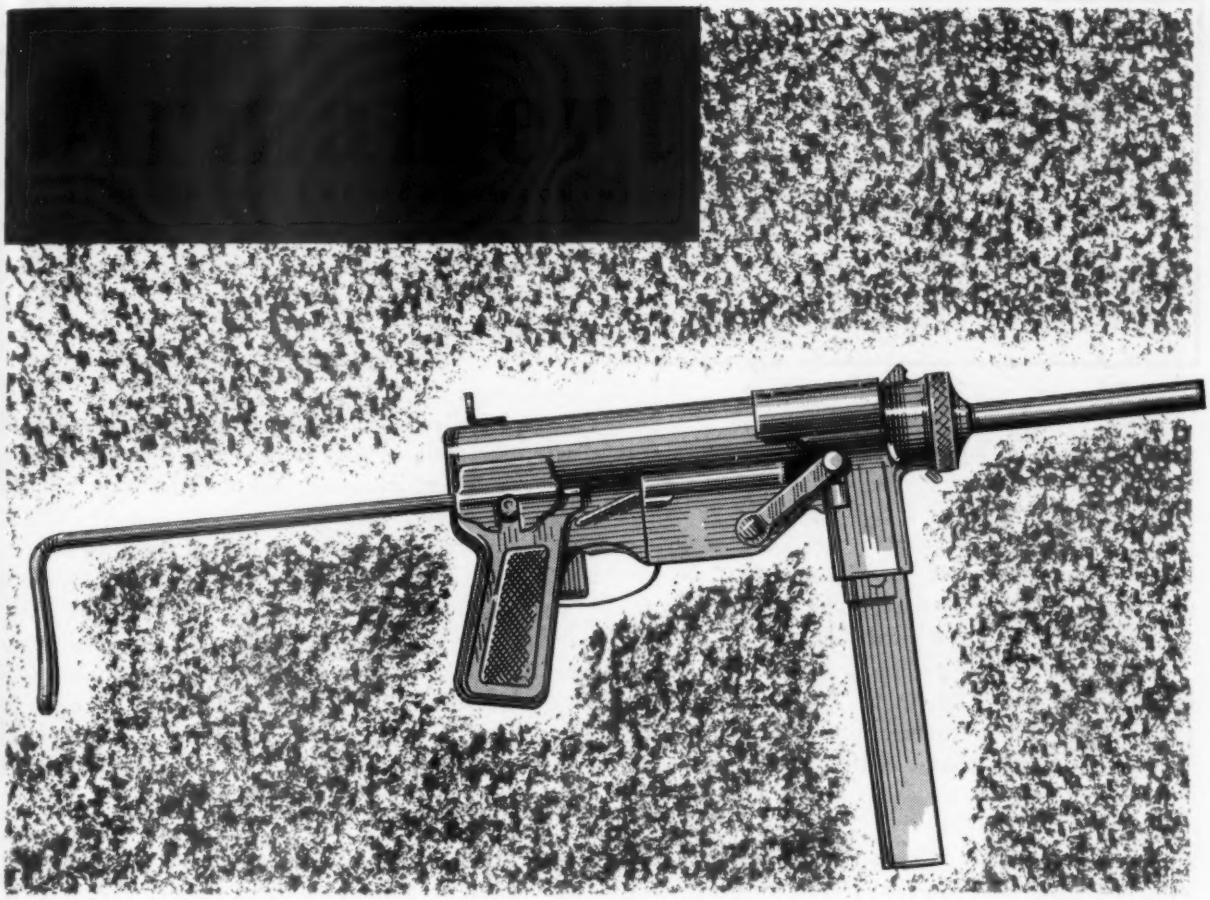
The drawing shows a method of holding angle iron in a punch press for accurately aligning and spacing punched holes. Frame *A*, attached to the punch press, is equipped with rollers *B* and *C* to carry the weight of the angle iron and hold it erect. Steel templet *D* is clamped over the edge of the angle iron, and is used to align the punch by pushing centering pin *E* forward while rolling the angle iron to the left until the pin engages a slot in the templet. Air rams *F* that close on the templet and angle iron are controlled by valve *G*. The air rams quickly close the angle iron against the lower die of the punch press, holding it secure while the hole is being punched. Air is released and the procedure repeated.

Prior to using this device, angle iron was skidded by hand across the punch die until the tip of the punch was in line with hole layout marks. The human element affected the accuracy of the work, and often the holes were out of line and spaced incorrectly. Production was slow and difficult.

The punch press templet has increased production 500 percent. Operator, fatigue has been minimized, and no great skill is required because the templet is duplicated automatically. A hole is punched every three seconds once the set-up is made. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



A templet and air-operated rams are used here to locate and hold angle iron for accurately spacing and punching holes



Novel Methods Speed Manufacture Of M3 Submachine Gun

IF YOU were to tell an old-time gunsmith about a weapon made from stampings, a few screw machine parts and a piece of tubing for a barrel, he would probably mutter something about the five-and-ten-cent store and go about more important business. And you could hardly blame him, for this brief description sounds more like a child's toy than a serious piece of ordnance.

It is true that Army Ordnance engineers have made a sharp break with tradition in the design of the M3 submachine gun. Gone entirely are the familiar steel forgings with their intricate machining operations. Gone also are most of the time-consuming processes that were once considered an essential part of gun making.

But the resulting product is not a toy nor a shoddy product in any sense. It is an effective, accurate weapon that is already contributing its part toward shortening the war. Its transformation from an idea to reality reflects credit to its designers, to the engineers who tooled it up, and to the men and women engaged in its manufacture. The M3 submachine gun marks a new advance in the application of precision pressed steel.

The gun weighs only 8 lb. and carries a magazine with 30 standard cal. 0.45 service cartridges, which it fires at a rate of 400 to 450 a minute. Designers of the gun point out that the objective was to keep the rate of fire down to such limits, for at this speed an experienced man can fire one shot at a time. Blasts can be made to follow a controlled pattern at this speed, whereas at higher rates the magazine may be emptied before the gunner can direct the spray of bullets where he wishes.

When a magazine is emptied the pressure of the thumb causes it to drop to the ground. A new fully loaded magazine is then inserted and secured by a self-locking latch. Firing is fully automatic; a blast

Weapon is fabricated almost entirely of stampings and screw machine parts at the Guide Lamp Division of General Motors. Barrels are made from seamless tubing and rifling grooves are formed by a press operation

of from one to 30 bullets is fired with a single pressure on the trigger.

A piece of heavy bent wire forms the stock so the gun can be used as a shoulder arm. The stock can be pushed forward so it scarcely overhangs the gun grip, making the weapon that much more compact and facilitating its fire from the hip.

In many ways the production methods employed by the Guide Lamp Division, General Motors Corporation, on the M3 submachine gun are as revolutionary as its design—the means of rifling the barrel, for example. But let us take it step by step.

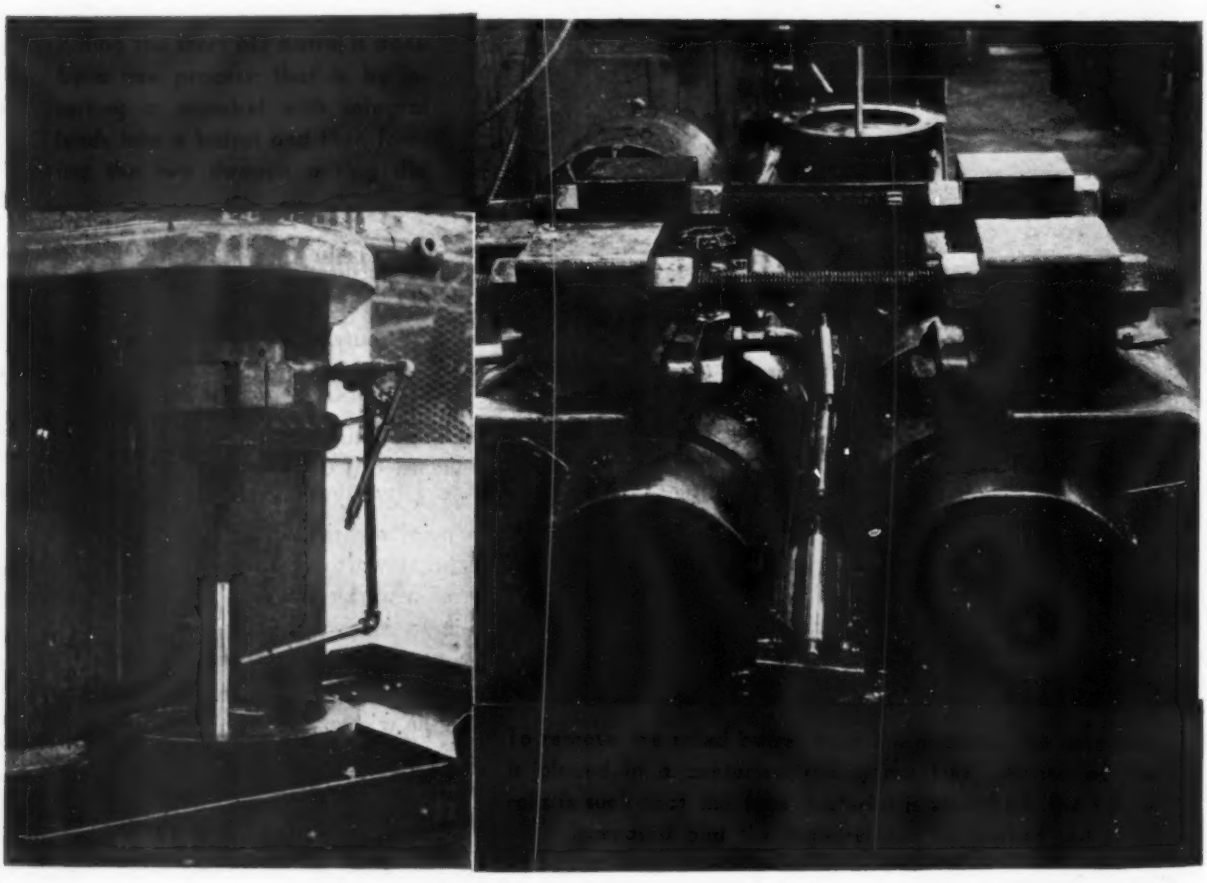
Material for the barrel is 27/32-in. commercial steel tubing with a 7/16-in. inside diameter; the steel conforms to Ordnance Department Specification WD8630. The tubing comes in 41½-in. lengths, and each length makes five barrels when sawn later.

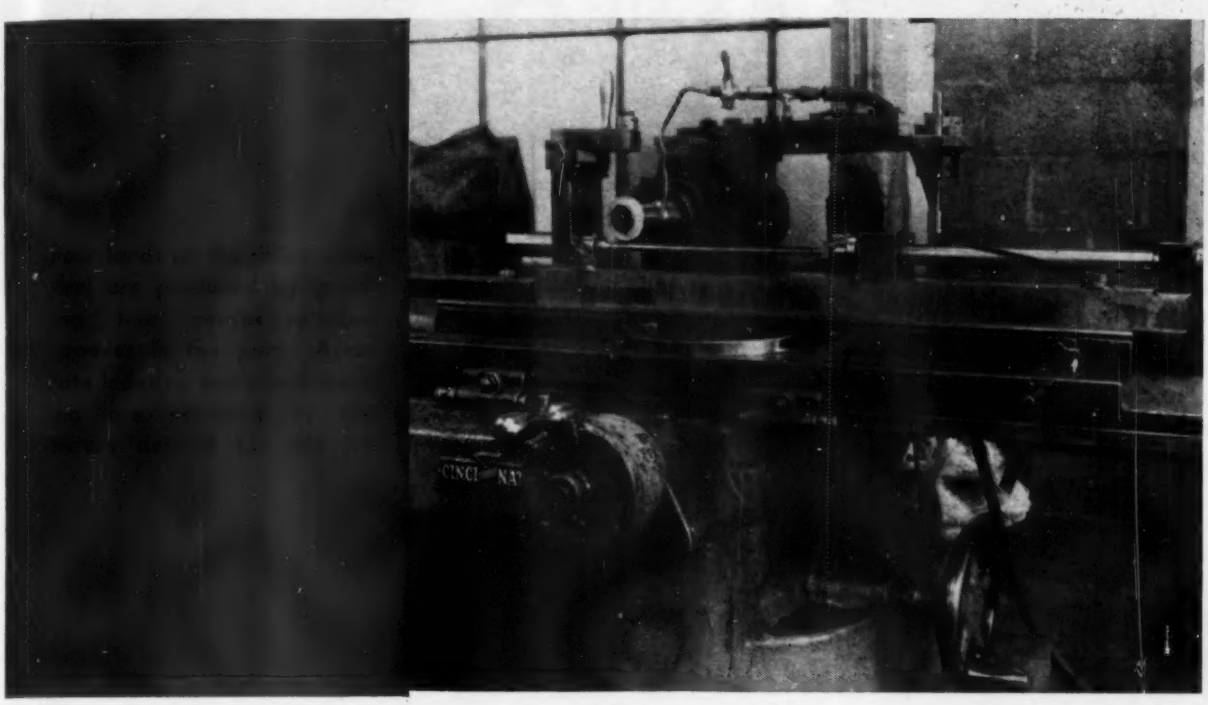
The first operation is to straighten the tubing in a Greenerd arbor press. Then both ends are burred and chamfered in an Allen sensitive drilling machine. For this step the stock is held vertically beneath the spindle of the machine by means of a toggle clamp.

Tubing is reamed vertically in 12-spindle Baush reaming machines. The tubes are still a full 41½-in. length, so that in reality 60 barrels can be handled simultaneously on each machine. These reaming machines feed the tubing upward against a revolving tool. Each spindle is controlled independently by a pushbutton to start a machining cycle that stops automatically. A new piece of tubing can be chucked after the cycle in that position has been completed. Two such machines rough and finish-ream the tubing, opening its bore to 0.460 in.

The reamed tubing is cut off in a standard power-driven hacksaw, five pieces at a time. The cut-off barrels are taken to a two-spindle Delta drilling machine, where the ends are faced and chamfered on the inside diameter. Pilots are used on the tools for this operation to make certain the chamfer is concentric with the bore.

Two tools on a Seneca Falls "Imp" automatic lathe turn the barrels to 0.820-0.825 in. on the outside diameter. The tools are set to divide the cut by being fed in parallel so that each will take half the length of the barrel. This turning operation is made with a round-nosed tool that will not give





too good a finish. In fact, a feed of approximately 1/32 in. is used to give the barrel diameter the appearance of a shallow thread. These turning marks are found useful in retaining lubricant when a subsequent drawing operation is performed.

After turning, the barrels are chamfered on the outside diameter on one end only. The purpose of this step is to provide easy entry into the drawing die which is used in the following operation.

The next step represents a radical departure from past barrel-rifling practice. Machining rifling grooves has always been a painstaking process because of the necessity to hold close limits and to obtain an extremely fine finish if the gun is to function correctly. The hooked cutting tool, which was used for many years and still finds some applications, resulted in a good job when applied with care, but there was always the chance of cutting the grooves inaccurately or with a rough finish. Consequently, an experienced machinist was always employed on a rifling machine when this type of cutter was used.

More recently the broaching method of rifling has become popular and has resulted in considerable savings in time. Machines using this process are more automatic and require less skill than those used with the hooked cutter.

The Guide Lamp Division has dispensed entirely with machining operations on the rifling grooves. Instead it uses a drawing operation by which the gun barrel is squeezed to a smaller diameter on a mandrel that has the rifling groove on its outside diameter in reverse.

In this process, four grooves are to be cut 0.004 in. deep, and 0.114 in. wide with a lead of 15 in. The grooves must be held to plus or minus 0.0015 in. Just prior to this operation the barrels are thoroughly cleaned.

A mandrel having a shoulder at one end for location purposes is inserted easily into the barrel. Clearance between the barrel bore and the outside diameter of the mandrel is about 0.010 in. The barrel is then placed vertically under the ram of a 15-ton Fox hydraulic press where it is squeezed through a hole in a cylindrical die, which reduces its outside diameter to 0.770 in. and lengthens it about 1 in. A mixture of Sturaco high-pressure lubricant and paraffin oil is used as a drawing compound. The barrel is fed completely through the die and comes out at the base of the press.

Removal of Barrel from Mandrel

But this is only half the story. The barrel is now squeezed tightly around the mandrel and keyed to it by the lands on its surface into which the metal has been pressed to form the rifling grooves. It now becomes necessary to free the mandrel from the barrel.

For this purpose the barrel is put into a specially designed rolling machine. This unit was made in the Guide Lamp toolroom and consists of two large rollers and a smaller supporting roller. The larger rollers are motor-driven and geared together by means of a chain so that one rotates approximately twice as fast as the other. The smaller roller merely supports the workpiece. The barrel is fed into the machine by means of a V-guide so that the rollers engage it at a slight angle approximately 1/32 in.

below the centerline of the rollers which provide a forward speed. The principle of operation is similar to that of a centerless grinding machine. The effect is to stretch the metal slightly and thus expand the barrel. When the workpiece emerges from the other side of machine, the mandrel is loose in the bore. The barrel is then placed in a V-groove with an end stop and the mandrel is pushed out.

The entire rifling sequence including the press work, rolling and mandrel removal is operated by three girls. The rolling machine and mandrel ejector are so located that the girl who takes the mandrels from the base of the press and feeds them into the rollers is also able to recover the mandrels and return them to the press operator. The girl who receives the barrels from the rollers places them into the mandrel-removing fixture. No skill is required at any stage of this sequence.

It is necessary to make the mandrels with care because the quality of the rifling depends upon their accuracy. They are made from Crucible Steel Company's Ketos non-deforming oil-hardening steel (carbon 0.90, chromium 0.50, manganese 1.15, tungsten 0.50). After hardening, the mandrels are rough-ground to 0.456 in. and then finish-ground to 0.4495 in. on the outside diameter. They are then placed in a Cincinnati grinding machine equipped with a special fixture for forming the lead. The fixture consists of a simple precision leadscrew to which the workpiece is connected by a plate provided with four pin holes to give correct indexing for the four lands on the mandrel. This arrangement insures the use of the same portion of the leadscrew for each groove so that the lead of each is identical.

The mandrel is mounted between centers and has a center support to keep it from deflecting. The grinding wheel is set at the correct helix angle. Directly above the wheel a diamond is mounted on a radius arm equivalent in length to the radius of the mandrel at the root of the land. It should be remembered that this wheel has to form the convex surface between the lands, so that it is necessary for the wheel face to be concave. In this machine the arbor is ground down to 0.4415 in. + 0—0.0002 in. between the lands. A special gage is used on the wheel to make sure that the radius and sides of the wheel are correctly centered before the grinding operation. After grinding, the mandrel is hand lapped, inspected and turned over to the barrel department for use in production.

Since there is actually little wear on the mandrel it can be used for a long time. In fact, more than 10,000 barrels have been obtained from a single mandrel before it has been necessary to discard it. After the rolling operation the mandrel is approximately half a thousandth loose in the barrel. It is necessary

for the mandrel to follow the lead of the rifling grooves when it is ejected, but this necessitates only half a turn and presents no difficulty.

If the mandrel is too tight in the barrel when it is removed, it may gall the barrel rifling grooves, and if it is too loose, size control is lost. Experience with the rolling machine, however, has made it possible to obtain the desired half-thousandth clearance as a regular part of the operation.

Bad Ends of Barrel Are Cut Off

Barrels coming from the rifling operation are inspected for size and straightness. They are countersunk at both ends and placed in Imp lathes, where they are again turned with two tools to an outside diameter from 0.770 to 0.775 in. They are then transferred to a Diehl lathe, where the ends are cut off and countersunk. Cutting off the ends of the barrel insures more uniform rifling, because of the spring-back where the barrel enters and leaves the drawing die. In addition, the drawing operation forms a cone on one end of the barrel and a cup on the opposite end of the barrel which the cutting-off operation removes.

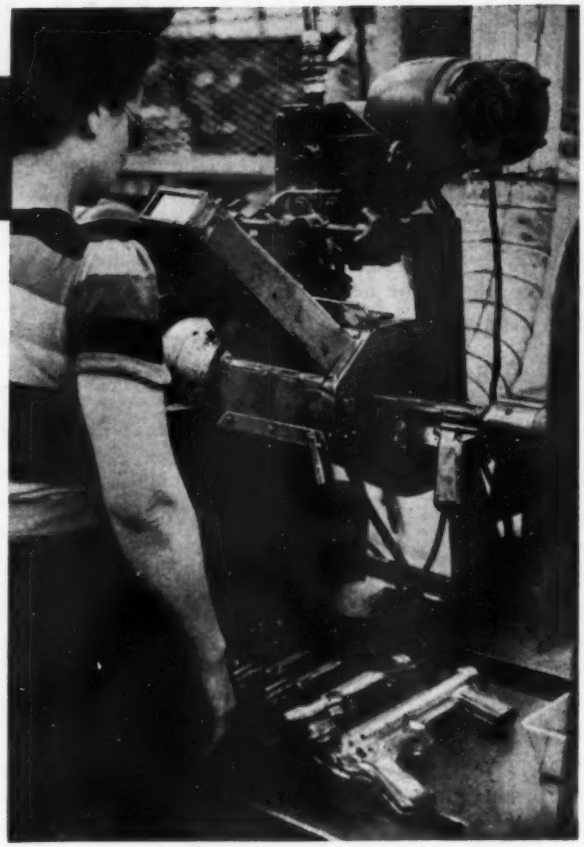
The barrels are then fed through two centerless grinding machines which respectively rough and finish grind the outside diameter. They are held to 0.0005 in. on this dimension. After this each barrel is inspected for size in a Sheffield shadow gage.

The collar which joins the barrel to the receiver is then pressed on in a 10-ton American Broach Company's hydraulic press. The collar is located in a bushing, and the barrel is held above it while the ram presses it downward with a press fit of 0.0003 to 0.0014 in. interference. Even this light forced fit may close in the barrel somewhat, but such a possibility makes no difference, since the next operation is to chamber the breech end of the barrel. This is done in a No. 2 Diehl hand screw machine.

The collar is then drilled and reamed in an Avey gang drill to key it to the barrel. Since the drilled hole is off center, a special jig is used to guide the drill. First a flat-pointed drill is entered to establish a flat seat on the angular surface of the collar. Then an ordinary twist drill is fed all the way through the collar and barrel followed by a reamer. A dowel is used to pin the collar to the barrel. A small ram attached to the drilling machine feed is used by the operator to drive the pin home. Then the ends of the pin hole are staked by means of a double tool in a hand-operated fixture so that the pin cannot fall out. The bullet seat and ramp are then gaged with flush pin gage, and the barrel is given a visual inspection. It is then turned over to the Army Ordnance inspectors for their own check-up.

Barrels that pass inspection are stacked 14 together in wire baskets with both ends sealed with rubber stoppers. Carried in this way they are cleaned with a petroleum solvent, given a hot water rinse and then coated by the Parker Lubrite process. This treatment takes about fifteen minutes and gives the barrels a black protective coating which prevents rust and kills the reflection of sunlight.

Following this treatment, the barrels are inspected by means of a rifling plug gage. This is simply a precision gage with lands on its outside diameter similar to the mandrel on which the rifling was formed. It is put through the bore of each barrel thus checking the size and lead of the rifling grooves. After final inspection by the Ordnance Department



representatives, the parts go into the bonded stores.

Manufacture of the pressed steel parts of the M3 submachine gun uses conventional tooling with certain variations in order to obtain a degree of precision not often associated with this method of fabrication. Limits of 0.003 to 0.005 in. are held on these parts. To achieve this accuracy more press operations are employed than in ordinary practice. After forming the parts are restruck, shaved, often with two shaving operations, and are given corrective straightenings in order to eliminate distortion and springback.

Since welding, both resistance and arc, is used to build up subassemblies the effects of heating are prevented in the welding fixtures or are removed by subsequent press or milling operations.

The most important stamped part on the M3 submachine gun is called the receiver. This provides the main body of the weapon which houses the bolt, and also forms the handle. The receiver is made of two sheet-steel stampings which are welded together, and numerous smaller stampings which are spot-welded to its exterior surfaces. In the end of the receiver, an internally threaded collar is arc-welded to receive the external threads on the collar which has been assembled to the barrel.

The receiver is made from coiled strip cold-rolled steel 0.062 in. thick. The blanks are stamped from the coiled stock and are then taken to the first drawing operation which is done in a toggle press. The next step is to emboss the knurling on the handle in a crank press. The halves are then finish formed and trimmed. In trimming, a flange is left around the outside of each stamping which is later fused to form the bead during the welding operation. A projection is left on the flange of both halves of the receiver to form the front sight.

Other press operations are to pierce five holes, to trim the front end and magazine housing and to pierce the ejection hole (in one half only). Then the stampings are burred, making them ready for welding. A small steel bushing is located on the receiver half by means of a fixture and then silver-soldered fast to the stamped steel over a natural-gas flame. This bushing later forms the sear pin bearing.

The stock guides are sheet-steel brackets through which the wire stock of the M3 submachine gun slides. These are also located in a fixture, together with the receiver stamping, and held in place by means of toggle clamps. In this position a Taylor Winfield spot-welding machine fuses the stock guides to the receiver. Then the assembly is turned around and in another set-up the opposite side of the guide is welded to the stamping. These stock guides are located accurately by rods in the fixture because they serve later as locating points in finishing the receiver assembly.

Operators Assemble Receiver

There are two press lines on the receiver; one handling the left half and the other, a duplicate of the first, taking care of the opposite half. In general, most of the operations are the same, the principal difference being a rectangular ejector hole in the right half. The two halves of the receiver are first brought together in a three-position fixture. This consists of a turntable on which the halves are located by means of the pin holes previously punched and with a plug that fits into the muzzle end. The two halves are clamped in place and tack-welded at a sufficient number of points to hold the assembly rigid. The assembly then goes to the main welding floor for finish welding.

Each part is handled by a set-up man, who slips an arbor into the assembly and clamps it securely into a welding fixture held on a universal stand. Each stand has a hand rest so the worker can guide the torch more accurately. It also has a brake to keep the fixture from revolving except when released by a treadle.

In the welding operation, flanges left on the two

stampings are fused without the use of additional metal. Any parts that have faulty joints go to a rework bench where a welding rod can be used to supply metal as required.

Press Sizing Receiver Holes

After welding, the receiver assembly goes through a series of finishing and sizing operations. For instance the round hole at the muzzle end is brought to proper size by pressing a plug into it on a 12-ton American Broach hydraulic press. A similar operation is employed to finish the magazine hole. Then the receiver is put on an arbor which acts as a die, while the two end holes are punched. These holes support rods upon which the gun bolt rides.

Then the receiver is held in V-blocks and clamped by a toggle while the end is bored with an Avey boring head. A collar is inserted in the bored hole, driven into place with a copper hammer and the whole assembly is mounted on a converted engine lathe for arc-welding the joint between the collar and the sheet-steel receiver. The collars are automatic lathe parts purchased from a subcontractor. The assembly is revolved slowly in the lathe while it is automatically welded by means of a Una welding head which feeds the electrode and ribbon flux automatically. After welding, the threads in the collar are cleaned by means of a hand tap. Next the sear pin-hole bushings are drilled in a fixture which holds the receiver from the stock guides at one end, and the thread in the collar at the other.

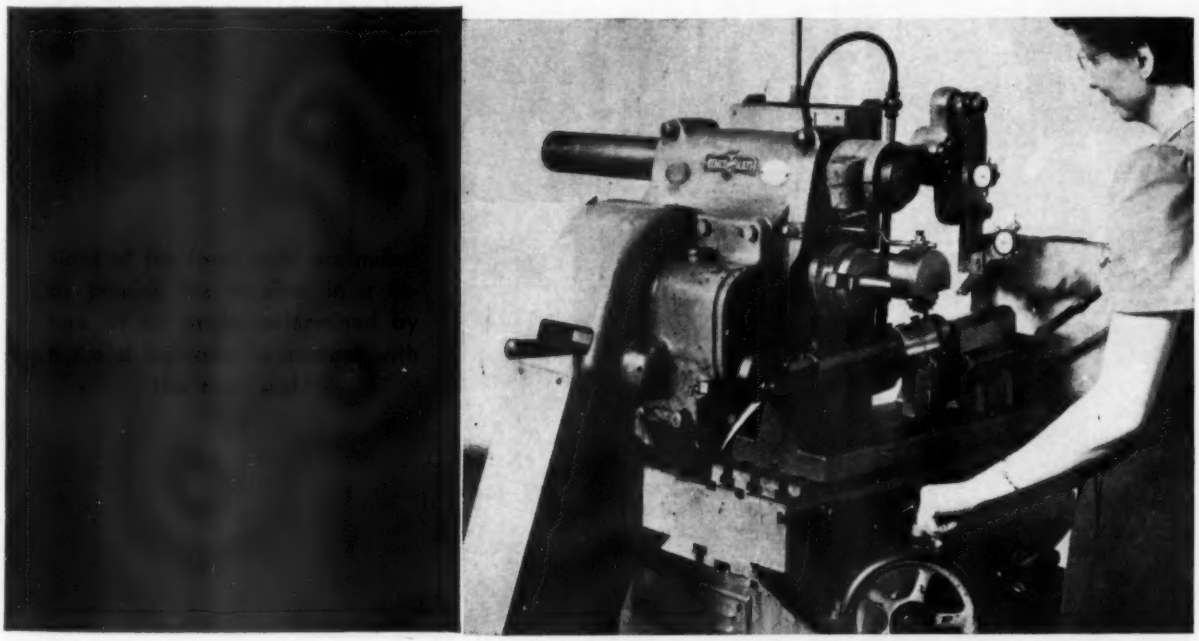
A series of milling operations finishes the magazine end, cuts away the flash for installing the ratchet spring, the trigger hole and the surface for the magazine catch strap. Then the trigger guard slot is cut in a Rigidmil. Another milling operation is to cut the angle of the front sight in a Kent-Owens hand milling machine.

The receiver is then mounted in a fixture and the rear sight is located on top of it in the correct position. The fixture is fed forward by means of a conveyor under a hood where the welders work. Each welder has two tracks of the conveyor, so that one fixture can be loaded while he is working on the other. Underneath the hood he arc welds the rear sight in place. At this point the sight is "blind," that is, no hole has yet been drilled in it.

The next operation is to mill the sides of the front sight. In this instance the receiver is mounted on a fixture at an angle determined by a dial indicator in contact with the rear sight.

Another press operation again opens and shapes the magazine hole. This is done by a punch shaped to the correct size and provides an additional straightening operation so that this opening will receive the magazine freely. A loose die is placed over the cylindrical section of the receiver during this operation so that it, too, will not be opened up by the action of the press. The receiver is then held in a cam-operated vise, while the slot in front of the trigger is milled in a Kent-Owens machine. Then the hinge that holds the ejector covering opening is spot welded in place.

M3 machine guns are assembled by line assembly with girls performing most of the work. The parts are brought from Army bonded stores and placed upon a continuous belt conveyor on each side of which work benches are located. The girls pick the parts off the belt and return them to it after their particular operations have been completed. At the end of the line a number of inspectors give the guns a preliminary hand



functioning test in order to make sure that the moving parts respond correctly to hand control. The guns are then placed in an overhead continuous chain conveyor that lifts them up and carries them across a roadway to the target room. Here the guns are given proving, functioning and target tests.

The procedure is to put the gun in an inclosed box of heavy sheet steel and first fire a proof charge, which has 25 percent more powder than the regular service ammunition. The box serves as a safety chamber and is safely arranged that the gun cannot be fired until the lid is closed.

Functioning Tests

Next in the same position one magazine of 30 cartridges is fired to make sure that the operation of the gun is flawless. Formerly 120 shots were fired in this functioning test, but so little trouble was discovered it was found that the number of shots could be safely reduced. Any malfunctioning is noted at this point and the gun is returned for adjustment if any is discovered.

In the targeting test, five shots must be placed within a 3-in. circle at 100 ft. distance. Actually seven shots are fired, two to warm up the barrel and five to score the target. If the gun meets this requirement, a telescope is mounted on the sights. The crosshairs of this telescope are brought into the center of the cluster of five shots. This is done by three setscrews in contact with the rear sight and a fixed contact on the front sight. The telescope mount is also provided with a small drill bushing, and when it is in the correct position, this bushing is used to guide a portable drill while a hole is made in the rear sight. This method of drilling lines up the gun sights with the average performance of the weapon in target firing.

But this is not the end of the tests on these guns. Each lot of 500 is segregated and kept together. Out of this lot 20 guns are selected at random. These are again completely disassembled, the parts are shuffled and reassembled indiscriminately. Then each gun is given further functioning and targeting tests with the parts originally assembled to other weapons.

Another precaution is to take two of these 20 guns, remove the parts and replace them with spare parts taken from bonded stock. After reassembly the guns are again given functioning and targeting tests, and in every instance must pass these tests before the entire lot of 500 guns is released.

Thus it can readily be seen that this production process requires every precaution to make certain that each gun is completely interchangeable, not only with weapons assembled in the same lot, but with spare parts that have never been through the assembly line before.

Tool Shanks and Tool Posts—III

Serrated Wedges. Serrated wedges are sometimes used with square toolposts in screw machines or in open side toolposts for vertical adjustment of the tools.

Adjustable Collar and Nut. An adjustable collar and nut fitted about the base of a round toolpost is sometimes used in screw machines to provide the vertical adjustment of the tools.

Open-Side Toolpost. The open-side toolpost for lathes, Fig. 3, carries one or more binding screws. It may be provided with either a rocker base or flat tool base plate.

Four-Way Turret Toolpost. The four-way turret toolpost used on manufacturing lathes, turret lathes, and vertical boring mills is an indexing, multiple, open-side toolpost (with fixed base or rocker), Fig. 4.

Strap and Stud Type. The strap and stud type of tool holder, Fig. 5, is generally fitted on large lathes, boring mills, shapers, slotters, and planers.

Studs or Headed Bolts. The studs or headed bolts are fixed to a T-nut fitted into the T-slot of the lathe tool rest or planer clapper, a distance apart indicated as B to accommodate the size of tool shanks to be used. The large lathes are provided with two sets of studs.

Strap. The strap is that member fitted over the studs bearing on the top of the tool shank. The tool rest is supported by the surface of the compound tool rest or on parallels used to provide the vertical adjustment of the tool.

Studs in a Planer. In a planer, the studs are attached (threaded or recessed) to the face of the clapper, Fig. 6, or in sliding T-nuts, Fig. 5, and pass through the serrated tool base plate against which the tool bears.

Terms and definitions for single-point tools are covered under the standardization of single-point tools. See American Standard for Terminology and Definitions for Single-Point Cutting Tools, ASA B5.13—1939.

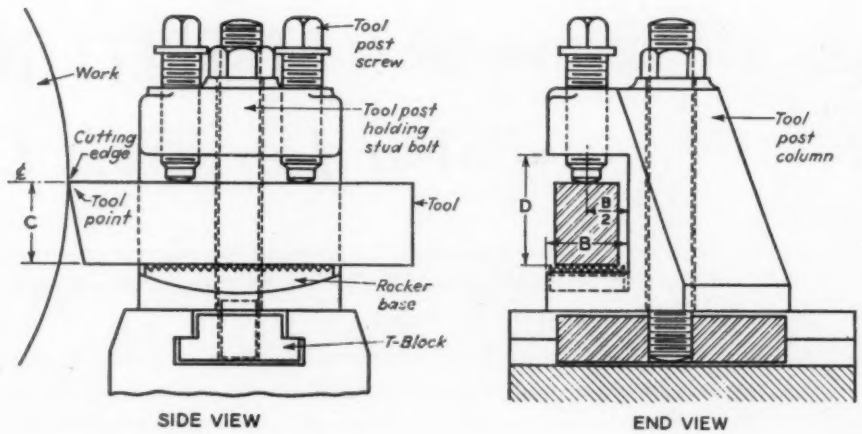


Fig. 3—Open-sided toolpost with serrated rocker base

Table 4 Shank of Tool Holders

Turning Tools w × h × l	Cut-Off and Side-Cutting Tools w × h × l	Boring Tools w × h	Threading Tools w × h × l	Knurling Tools w × h × l	Carbide Tipped Tool Holder w × h × l	Planer Tools w × h × l
5/16 × 1/2 × 4	.....	.....	.....	.....	.....	.....
5/16 × †3/4 × 4 1/2	5/16 × 3/4 × 4 1/2	5/16 × 3/4	5/16 × 3/4 × 5	5/16 × 3/4 × 5	.....	.....
5/16 × 7/8 × 5	3/8 × 7/8 × 5	3/8 × 7/8	3/8 × 7/8 × 5	*3/8 × 7/8 × 5	3/8 × 15/16 × 6	.....
1/2 × 1 1/8 × 5	1/2 × 1 1/8 × 6	1/2 × 1 1/8	1/2 × 1 1/8 × 6	*1/2 × 1 1/8 × 6	1/2 × 1 1/4 × 7	1/2 × 1 × 6
5/8 × 1 3/8 × 7	5/8 × 1 3/8 × 7	5/8 × 1 3/8	5/8 × 1 3/8 × 7	*5/8 × 1 3/8 × 7	5/8 × 1 1/2 × 8	5/8 × 1 1/4 × 8 1/2
3/4 × 1 5/8 × 8	3/4 × 1 5/8 × 8	3/4 × 1 5/8	.....	.....	3/4 × 1 3/4 × 9	3/4 × 1 1/2 × 10
7/8 × 1 3/4 × 9	7/8 × 1 3/4 × 9	7/8 × 1 3/4	.....	7/8 × 1 3/4 × 9	7/8 × 1 7/8 × 10	.....
1 × 2 × 11	.....	1 × 2	.....	.....	1 × 2 1/8 × 12	1 1/8 × 1 3/4 × 13
1 1/4 × 2 1/4 × 13	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	1 3/8 × 2 × 16
.....	.....	.....	.....	.....	.....	1 7/8 × 2 1/4 × 19
.....	.....	.....	.....	.....	.....	2 1/8 × 2 3/4 × 22

All dimensions are given in inches.

* Tolerance of +1/64 in. may apply.
† Tool heights in bold face are listed in Table 1.

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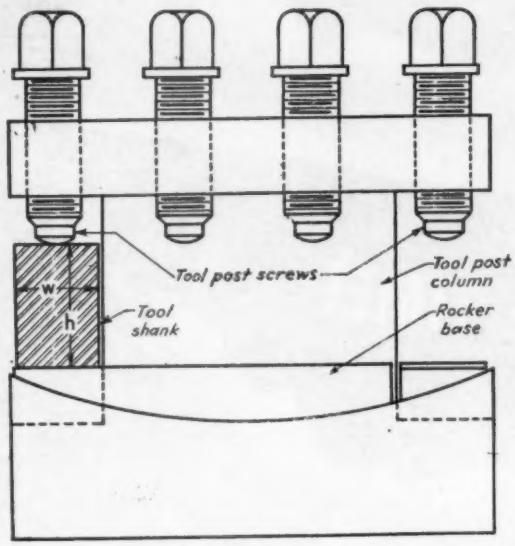
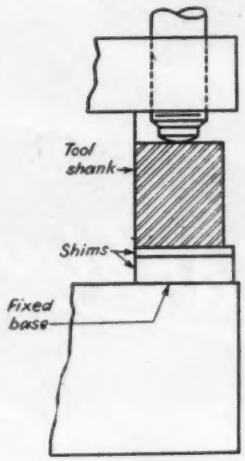
Tool Shanks and Tool Posts—IV



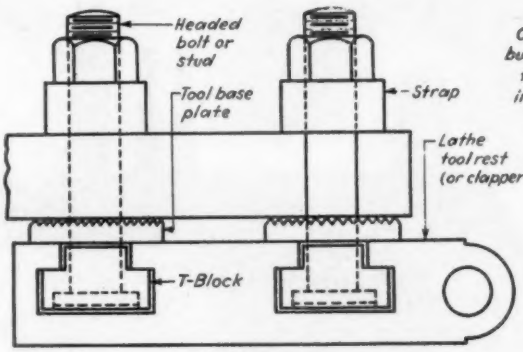
END VIEW



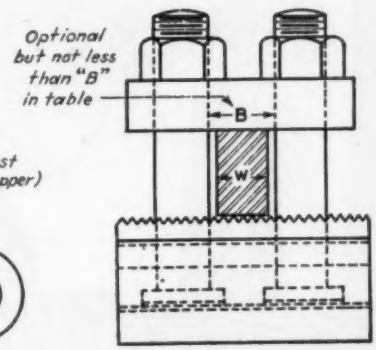
END VIEW

Fig. 4—Four-way open-sided toolpost

Fig. 5—Strap and stud clamp type of toolholder with serrated base



SIDE VIEW



END VIEW

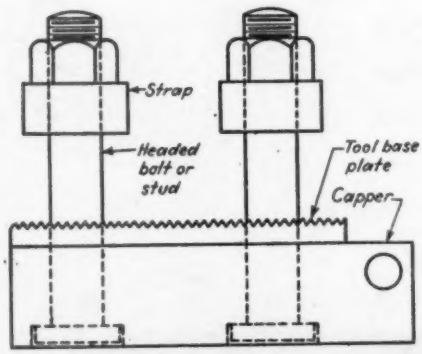
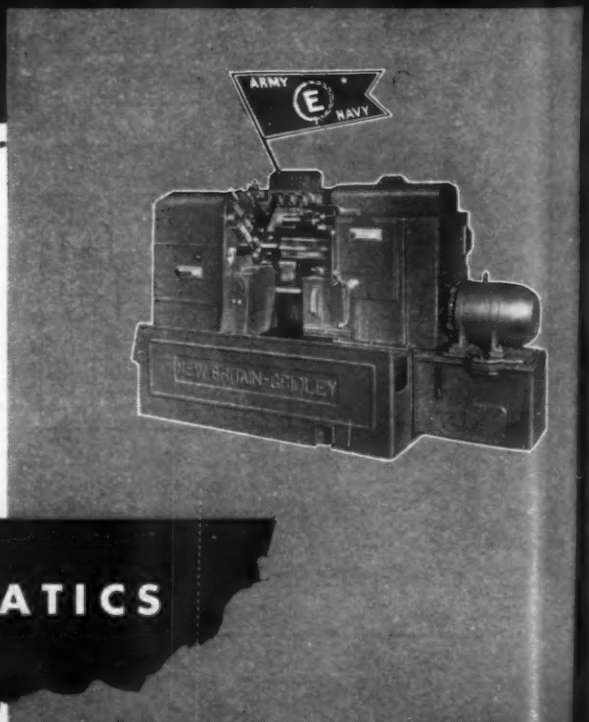


Fig. 6—Planner studs

YOU CAN'T *Make* TIME

Marking TIME!



New Britains are designed and built on the belief that *seconds* quickly add up to *dollars*. Exclusive New Britain features save important re-stocking time. Basic construction eliminates costly shut-downs for overhaul, lubrication, and adjustments. In other words, New Britains get more done per day, year in, year out. That's important, in war or peace.

New Britain-Gridley Machine Division • The New Britain Machine Company • New Britain, Connecticut

NEW BRITAIN AUTOMATICS

Gaging Business

More! Ever More!

Though many sectors of the war production program report satisfactory progress, others are not up to schedule because of manpower stringency. In such items as heavy forgings, heavy castings, non-ferrous mining and communication devices, manpower is the controlling factor. Even in shipyards, which have been doing very well, more men are needed. One yard, for example, is seeking 9,000 and another 2,000. The bearings industry presents another bad situation so far as availability of labor is concerned.

Push Invasion Production

The shifting requirements of war have changed the production plans ahead. A sharp rise of 25 percent is sought in output of aircraft, large trucks, landing craft and heavy artillery. Those are the products most in demand and that must be produced in ever larger quantities as the year goes on. Along with this most critical list is an urgent need for airborne electronic equipment and for most types of naval combatant ships. Something like four-fifths of the entire program is of the items now short.

Concurrent with these shifts is production of items for which the demand is declining. Most ground Army items, such as ordnance, destroyer escort vessels and Liberty ships are slackening because of adequate stockpiles or for other good reasons. Liberty ships are being supplanted by Victory ships of greater speed and better design.

Changes Cut Output

In March, output of war goods fell short two percent of meeting the overall schedule. Figures are not yet at hand for April, but it appears reasonable to expect that the total was at least equal to March's and perhaps higher. The biggest production headaches are bound to come from attempts to get new emergency programs established on a rapidly expanding scale. In radio alone, for example, some 120 new items have been introduced since the start of the war. We are no longer fighting with the same weapons used at the outbreak, most of them having been refined and further developed since then.

Navy Ups Shell Orders

With the use of huge quantities of larger shell in the Pacific offensive campaigns, Naval ordnance production schedules have been upped. Increases have occurred in programs for the larger size guns and ammunition, more than offsetting decreases in the smaller sizes. The ship construction program for the Navy will be strictly adhered to as long as the Jap war lasts, the present program running into 1947. Although guns, fire control and ammunition are down, the volume is being maintained above schedule.

Steel and Lumber Tight

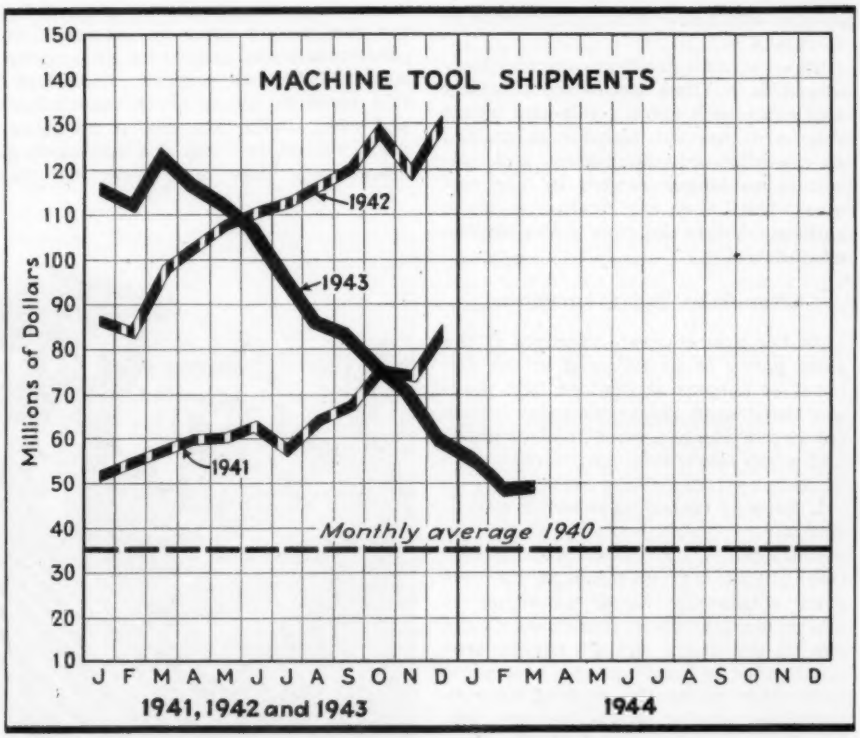
Steel has never been much tighter than now. Plates and sheets in particular are in exceedingly heavy demand. The situation is not expected to ease for some time. Shell steel has shown a pick-up as the shell program in general came back into prominence after a considerable lull. Steel has been completely eliminated in favor of copper for shell cases. Lumber continues the tightest item of all. Operating rates of steel companies having 94 percent of steel capacity, after slumping into the high nineties, again rose to 100.0 percent of capacity during late April—the same as one year ago.

See Prediction Bettered

Machine tool orders have continued on a scale somewhat larger than prevailed early in the year. Shipments by builders have been running along on a basis of about $600,000,000 a year, but it is not likely that that volume will be sustained at that level later on. With an output of $157,246,000 during the first quarter and with April business estimated at about the March total, it seems a fair guess that the year's production of machine tools will be somewhat more than the $375,000,000 so widely predicted, even though shipments should drop considerably the last half of 1944. The amount of orders placed by the Soviet government lately has been very large, but difficulty is anticipated in getting ships in which to send machine tools to Russia. The industry continues to lose many key men to the armed services.

Truck Backlog Estimated

Trade sources estimate a 1,250,000 backlog of potential truck sales accumulated since rationing was imposed March, 1942. Nineteen percent of trucks on the road are at least 10 years old, 8 percent 15 years old.



Shipments, Orders, Cancellations up—Machine tool shipments in March rose to $50,799,000, a 1.5 percent boost over February's $50,098,000. March orders totaled $41,854,000, an increase of 19.6 percent over the February total of $34,995,000, which in turn were 12.7 over those received in January. Increases are attributed to step-ups in such military programs as trucks and aircraft engines. March order cancellations of $1,847,000 were 7.1 percent above February's $1,725,000. The backlog of unfilled orders at the end of March was $153,079,000, a decrease of 6.9 percent from $164,424,000 at the end of February

Surplus Property Administrator Outlines Disposal Plans

Policies generally favor sales to today's hungry markets, as an anti-inflation measure, and oppose sales to speculators and the dumping of surpluses

WASHINGTON — Direct negotiation, sealed bids and auctions are the methods to be used with the approval of the office of the Surplus Property Administrator in the disposal of surplus war equipment and materials. Negotiation will be favored wherever possible as the best of the three methods.

SWPA Will Only Administer

There is no intent on the part of Mr. Clayton's organization to be drawn into the actual disposal of goods. The agency will be solely administrative and will be small in size. A policy of decentralized disposal will be carried out, with the Reconstruction Finance Corp., charged with the duty of disposing of capital goods, using some 20 of its 31 district offices. The Army and Navy also will employ their nearest district offices. A central inventory system will be developed, however, so that the buyer in Los Angeles, for instance, will know what is available in Boston.

The main problem immediately ahead is to find out what property and equipment are for sale and where they are located. Surplus is defined as meaning only equipment and materials no longer needed by the services. Until such certification is made, equipment does not pass to the surplus administrator.

Scrap Sales Policy Announced

As the first concrete example of the sales policy to be followed in the disposal of surplus equipment, Mr. Clayton has issued rules governing prices for raw materials, semi-finished goods and scrap remaining upon termination of war contracts. They are:

1. Sales of materials remaining from contracts or subcontracts where the claim against the government is less than $10,000 may be made at the best price obtainable. Small quantities of remaining materials, regardless of the size of the claim against the government, may be made at the best price obtainable where the cost of all substantially similar items at any one location does not exceed $1,000. Contracting officers must make reasonable tests of existing markets.

2. Crude or raw materials not covered by paragraph 1 should be sold at going market prices, if in commercial lots, where there is a clearly established and readily ascertainable market price. Where sales cannot be made at market price, material will be turned over to a federal disposal agency for disposal.

3. Usable property, other than raw materials, which is not covered by paragraph 1, may be sold to a buyer, whether he will consume it or not, at the best obtainable price in excess of 75 percent of the cost of the material or the price of an equivalent quantity in normal supply channels, whichever is lower. If no sales can be made on these terms, the property may be sold at the best obtainable price to anyone who will consume it in the United States for manufacture, maintenance or repair purposes and who will promise not to resell it at a profit if he does not consume it.

4. Responsibility for determining what is scrap is on the procuring agency. Decisions to scrap property valued at more than $50,000 will be subject to review by boards to be established by disposal agencies. Scrap not covered by paragraph 1 may be sold at the going price for the type or grade involved, as ascertained by the contracting office by reference to published trade indicators or inquiry among informed sources. Consideration must be taken of transportation and other similar charges. If the going price cannot be had, the contracting officer may take bids, reserving the right to reject all of them. Clayton's organization will issue regulations providing for reports to disposal agencies of scrap sales and establishing a mechanism for halting scrap sales in any area where prices drop to unsatisfactory levels.

Consider Storage Plans

It is expected that relatively little equipment will be avalaible for final disposition until after the end of the war with Germany. Plans are now being considered for storage of some equipment and surplus goods in war plants that will be used as warehouses. Barracks at army camps, for example, may be utilized for storage of clothing.

DEFERMENT STEPS EXPLAINED

WASHINGTON — The War Production Board Office of Manpower Requirements has prepared a concise sumary of the steps which an employer should take to obtain full consideration for deferment of essential employees. The publication, entitled "Advice to Employers Regarding Selective Service Procedures," summarizes the assistance which the WPB Regional and District Offices can provide.

Light Weapons for Heavy Work—The ease with which workmen unload multi-barrelled rocket guns from trucks indicates the lightness of the construction of these newest of anti-aircraft devices. Such lightness facilitates mobility and concentration

General Motors and Tool Builders Discuss Postwar Equipment Designs

DETROIT — Immediate postwar requirements for machine tools by the various divisions of General Motors Corporation were discussed in detail by O. E. Hunt, G.M. vice president, at a joint conference of the corporation's master mechanics and plant engineers with more than 200 representatives from the nation's more important machine tool plants held here on April 27 and 28. The two-day meeting also was addressed by James Y. Scott, president of the National Machine Tool Builders' Association and president of the Van Norman Company; C. L. McCuen, vice president of General Motors Corporation; H. T. Johnson, General Motors Corporation director of standards; G. J. Bates, G. M. time and motion study engineer; and C. J. Werner assistant chief engineer of Delco Products Division, General Motors.

James Y. Scott

GM Requirements Outlined

Ten requirements for machine tools of the future were outlined by H. T. Johnson in his talk on "Usage and Maintenance of Machine Tools." He recommended an intensive standardization program on the part of the National Machine Tool Builders' Association, pointing out that machine tool elements and model designations are in urgent need of standardization. Machine tools of the future, according to Mr. Johnson, should provide the increased ranges of speeds and feeds made necessary to produce better finishes at these higher speeds. He reported that General Motors' master mechanics believe there will be a gradual trend away from hydraulic feeds, with extensive use of electrically operated feed units, because of present maintenance experience. In general, G.M. divisions prefer full electrical control of machine tools, if control elements are accessible and durable, with no "buried nicknacks" that are difficult to service.

While, in general, the present designs of machine tools are proving satisfactory, Mr. Johnson reported that the need for removing more material in less time will make sturdier, more rugged machines necessary. He pointed out, also, that G.M. master mechanics report a big field for improvement in means for removing chips from machine tools. In general, they say that chip disposal methods are bad now, but will be much worse when higher machining rates are more generally used, unless some better methods are developed.

In most cases, according to Mr. Johnson, General Motors' men are satisfied with present methods for lubricating machine tools, but believe the manufacturers of such equipment should work toward having every bearing lubricated automatically. With regard to hardened and ground ways, he reported that the G.M. divisions want such ways on machine tools, but want them mounted in such a way that they can be removed for reconditioning on an ordinary surface grinder with a long table. Too many machines must be returned to the factory for reconditioning when the ways need regrinding. Mr. Johnson also reported that General Motors likes and will use electronic means for motor control on machine tools, but must train maintenance personnel to take care of it. More data that can be used for this purpose must be furnished by makers of electronic equipment. He said that this field needs to standarize soon on ratings, tube sizes, tube bases for like tubes, etc., since a bad situation seems to be developing with regard to the stocking of spare parts for the maintenance and repair of electronic controls.

Urges Accessibility

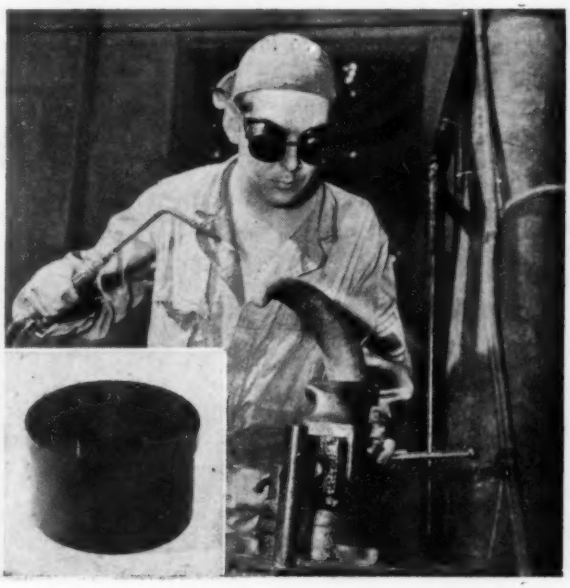
Mr. Bates discussed the desirability of giving more thought to the man who must operate the machine when the machine tool is designed. In his talk on "Motion Study Applied to Machine Tools," he pointed out that too many times control levers and push-button stations are placed in inconvenient or dangerous locations.

In his talk on "Machine Tool Motors," Mr. Werner pointed out that the choice of a motor is best determined from an accurate load analysis, which should include normal and maximum values of starting or break-away torque, accelerating torque and load torque requirements. He announced that the Delco Products division is planning to introduce a "G.M. Special" line of machine tool motors designed to withstand the exacting service requirements of the automotive industry. They will not be available in rerated NEMA frame sizes.

A feature of the conference was the exhibition of a large number of photographs of installations of electrical

O. E. Hunt

equipment on machine tools which were criticized by General Motors plant engineers because of faulty design, danger to operators or maintenance men, or failure to protect the equipment adequately from mechanical damage or from oil, coolant or dirt. Specific recommendations were made by the G.M. representatives. The machine tool representatives were given copies of a tentative electrical standard for machine tools which differs materially in some features from the American Machine Tool Electrical Standards (ASA No. C74-1942) sponsored by the National Machine Tool Builders' Association.



No Bull!—Faced with the need of quickly replacing a shattered bakelite cannon plug in the fire wall of a Curtiss C-46, Tech. Sgt. O. D. Smith, Tenth Air Force Base, India, clipped a horn from a water buffalo, tested it for dielectric and heat-resistant qualities and tooled it in the machine shop to the finished product shown in the inset

War Manpower Commission Outlines Program for Orderly Worker Shift

WASHINGTON—War Manpower Commission has outlined for its field representatives a six-point program for the orderly shift of workers, made jobless by changes in war production programs, to other industries.

The plan is based on an agreement with war procurement agencies whereby WMC is to be kept informed of impending production adjustments and the number of workers apt to be affected by them. With this knowledge, WMC can attempt before the fact to find new jobs for the workers who stand to be dropped. This would save manhours which otherwise would be wasted in job-hunting and would keep in the labor market persons, principally women, who might otherwise fail to take new jobs.

WMC Chairman Paul V. McNutt emphasized that the plan is based not on the expectation that the nation will be faced with a big unemployment problem in the clearly foreseeable future, but on the necessity for the most effective utilization of manpower.

When informed of forthcoming production cutbacks, local WMC people are to find out from the employers in question the probable net reduction in labor force and the number and type of employes to be released. Under the plan, they then would:

Steps Are Listed

1. Enlist cooperation of employer and employe in arranging termination of employment for affected workers.
2. Enlist employer and employe representatives in a campaign to keep all affected workers in the labor market.
3. Arrange for statements of limited availability if there is any likelihood that the workers may be recalled.
4. Encourage employers to refer released workers to the local employment office, or possibly have the local office station its personnel at the plant to handle job applications by the released workers.
5. Develop recruitment by other employers where no local job openings are immediately apparent, and possibly explore the necessity for interarea recruitment.
6. Arrange with the state unemployment compensation office for the prompt handling of benefit claims by released employes.

Report Truck Bookings

CHICAGO—Domestic bookings of electric industrial trucks and tractors during January totalled 122 units, according to the Industrial Truck Statistical Association. The net value of chassis only booked during January totalled $510,492.50, compared with $977,577.43 in December.

Incentive Plans Up Output

WASHINGTON—Incentive wage plans are paying off in production increases which average between 25 and 40 percent in areas where they have been adopted, director John W. Nickerson of WPB's Management Consultant Division reported recently.

With 95 percent of the plans indicating gains of five percent or more, some plans run as high as 150 percent production boosts in specific plants, Nickerson declared.

Plans based on time studies and applied to individual workers are averaging better than 60 percent increased production, and other plans, based on past performance and applying to whole departments and plants, boost output on an average of about 30 percent.

Nickerson emphasized that wage incentive plans should be carefully planned and operated to avoid labor-management disputes and possible production decreases.

Chemists to Honor Dow

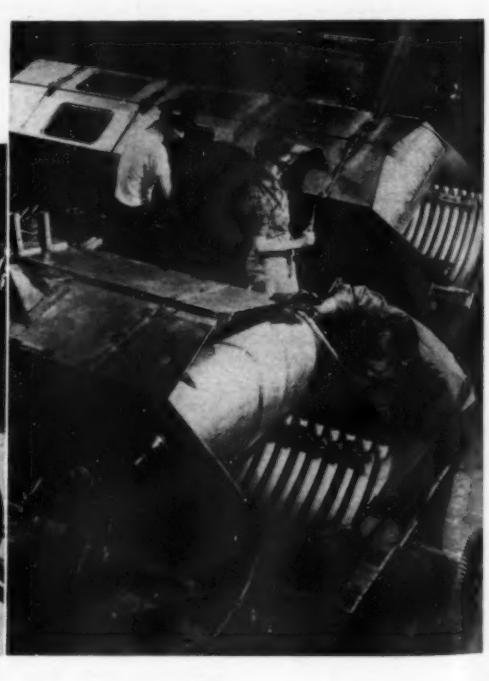
CHICAGO—Dr. Willard Henry Dow, president, The Dow Chemical Co., has been selected to receive the Gold Medal Award of the American Institute of Chemists for 1944. The medal is to be presented at the annual meeting of the Institute in the Biltmore Hotel, New York, May 13.

OPA Provides Alternative Used Tool Pricing Method

WASHINGTON—The Office of Price Administration has issued amendment 4 to its Maximum Price Regulation No. 1, governing prices of second-hand machine tools, with the new regulation effective April 25.

The amendment provides an alternative method of pricing second-hand tools or extras which were bought new after March 1, 1941; sets maximum prices for rentals or leases; requires that selling prices need be reported only to OPA and not to WPB; clarifies the definition of portable machine tools, and makes certain changes in the appendix regarding prices for tools not previously listed and for tool equivalents.

Built Like Warships—Compartments in all-metal liferafts, built by Weber Showcase Co., add strength and provide storage space. In a master jig, below, component sections are welded. Right, water tanks are installed near the corners



Inside Detroit

BY SILER FREEMAN

Parts Production, Says Packard

George T. Christopher, hard-hitting president of Packard Motors, has set the industry on its collective heels by announcing that Packard, among other manufacturers, had been permitted to sort its peacetime tools out of storage to set up a production line for spare parts, with WPB approval.

The WPB hastily rejoined that while Packard's application for resumption of manufacture of essential spare parts was in their hands, it had made no decision. However, it has been learned that the WPB has made a careful survey of the Packard application and has a report which is now in the hands of Col. John H. Middlekamp, director of the automotive division of WPB.

May Change Mind

Because another firm, in Flint, had previously been turned down on a similar application, involving $375,000 in facilities, Packard's petition, which involves nearly a half million, stands a good chance of being turned down. At the beginning, Middlekamp was said to have been in favor of permitting the company to set up its production line from its storaged machinery and go back to work. He may change his mind now.

Because of the increased number of cars going off the road for lack of essential parts, Packard began as far back as last November to ask for permission to make spare parts. It made a survey of 791 cars which were down for lack of one or more essential parts.

Some Machinery Sold

There is no way in which the War Production Board can prevent a company from restoring its own machinery. But the trouble Packard encountered was that some of the necessary machinery had been placed in the industry pool and been sold or transferred to others. In other instances, the motors have been taken off the machines and either sold or transferred to war jobs.

It was therefore necessary to get WPB's permission to place orders for the machine tools and motors. Not being planned for war work, it could have no priority rating. So among other things, Packard is seeking permission to place orders for machine tools and electric motors without a priority, to be filled where possible and where there are no orders with priority numbers ahead of it. Because of the slackening off in the machine tool industry, Packard was confident it could get its orders filled quickly enough to resume production of spare parts without too much delay.

Although crowded against the four walls by war work, Packard has satisfactorily worked out a way to make room for its spare parts. It has cleared out all available space, no matter if the space was desirable for future use or not. It took down some punch presses it no longer needed and cleaned out the bins of spare parts on hand, even if it made dealers' warehouses bulge.

But the principal way it made room was to subcontract even more than in the past. It has spread $275,000,000 in contracts among 139 subcontractors and is ready to ship out another $125,000,000. This will free considerable space and at the same time enable them to keep up production of Rolls engines and marine motors.

With an eye to possible resumption of auto production, it is giving the subcontracts to other than auto vendors in the regular field. It is going mainly in the aviation field, to firms which have machinery which can be used on aircraft parts and who have been affected adversely by changes in Air Corps contracts. It is also using firms in areas not counted as critical in manpower. One of the largest subcontracts went to a firm in the New York area which had been cut off entirely on the trainer program.

Models for Planning—Allis-Chalmers field engineers will carry sets of models of unit substation equipment to help plant planners work out perplexing power disribution problems. Accurately scaled ½ in. to 1 ft., they may be quickly assembled on scaled layout sheets, in accordance with diagrams of possible unit substations arrangements and plant design limitations

Parts Are Emphasized

Packard may be the bell-wether in a drive to get the industry as a whole permission to resume parts production. The top officials of the large firms agree that now is not the time to get back into new car production. They went to the Washington meeting with this firm conviction.

But they are just as unanimous in the opinion that they should be permitted to make spare parts to save the 24,000,000 private cars left on the road. As the age of the cars grows with every month that the war drags on, the casualties for lack of vital parts increase.

George Romney, managing director of the Automotive Council; C. E. Wilson, president of General Motors; K. T. Keller, president of Chrysler; George Mason and A. M. Wibel of Nash all agree that need for new cars would be lessened if they could make the parts to keep the present population of automobiles in working order.

See Reconversion Speeded

The auto officials also point out that by being allowed to place their machines in operation on 1942 parts, it will hasten the ultimate reconversion by at least two months. In that way, the problems of unemployment for any great period will be more or less eliminated.

"Certainly, we are looking ahead to that," one stated frankly. "We are going to place our machines wherever we can right now, no matter if they fit in with our later plans or not. Every machine in operation when Germany or Japan or both collapse will mean that much work accomplished.

"Figure it out in dollars. We expect to hit a pace of $120,000,000,000 a year production in this country. That is at the rate of $10,000,000,000 a month. For every month we cut off of our reconversion period, it means a saving of $10,000,000,000. Isn't that worth while?

Why quibble about termination amounts when money like that is at stake?"

The feeling in the industry is that the WPB will go along on this program and will give the entire industry a chance to start even on parts production.

Papers and Exhibits Features of Westinghouse Machine Tool Forum

PITTSBURGH — The Ninth Annual Machine Tool Forum sponsored by Westinghouse Electric & Manufacturing Co., held here May 1 and 2, was attended by nearly 500 representatives of machine tool plants, government agencies and foreign purchasing commissions.

The forum was opened with a talk by L. F. Mitchell of Westinghouse, who cited the responsibility of the machine tool industry in helping to retool rapidly for the change to peacetime production of civilian goods when the war ends.

New ideas for machine tool electrification were described by G. A. Caldwell, manager of Westinghouse's general mill and resale engineering section. These included electronic speed and load controls for spindle and feed motors, a tracer mechanism in which a 0.0004 in. movement of the tracer will give full electrical response and a servo-motor circuit for interconnecting electrically spindle and feed motors when a wide speed range is necessary. The tracer mechanism and a number of other Westinghouse electrical developments were shown in an exhibition held in connection with the forum.

Discuss Carbide Milling

Dr. H. A. Frommelt, director of research, Kearney & Trecker Corp., presented a paper on "Carbide Milling of Steel." Warner Seely, secretary, Warner & Swasey Co., presided during discussion of Dr. Frommelt's paper, by H. L. Pope of The Cincinnati Milling Machine Co., P. M. McKenna of Kennametal, Inc. and B. P. Graves of Brown & Sharpe Mfg. Co.

A written discussion by E. O Lowell of Grayson Manufacturing Co., who was unable to attend, was read by Don McGill of Westinghouse, chairman of the Forum.

A Westinghouse film "Electronics at Work," was shown by W. I. Bendz. Later E. L. Hemingway, chief metallurgist of The Foster Division of The International Detrola Corp., presented a paper on "Cause and Control of Surface Damage." Mr. Hemingway discussed the results of tests, comparing bearing surfaces finished by cylindrical grinding and by superfinishing. One of the points made was that, within reasonable limits, geometrical accuracy is as important as quality of surface finish to the efficiency of a sleeve bearing assembly. His paper was discussed by Hans Ernst, director of research, Cincinnati Milling Machine Co., and John Boyd, Westinghouse Research Laboratories.

Discuss Material Improvements

"Research Advancements in Materials" was the subject of a talk by Dr. A. A. Bates, manager of the chemical and metallurgical department, Westinghouse Research Laboratories. He discussed the many possibilities of recently developed materials, and of those which have been improved.

A session devoted to discussion of the electrical requirements of the machine tool industry was opened by L. W. Scott Alter, president, American Tools Works. His address was discussed, from the viewpoint of the electrical manufacturer, by G. H. Garcelon and W. P. Kelly of Westinghouse. Following this discussion, the Forum was divided into two groups; one dealt with subjects of special interest to electrical and design engineers while the other group discussed commercial and general problems facing industry.

Hear Control Discussions

The engineering group heard papers on "Control Assembly Factors' by E. E. Opel of The National Automatic Tool Company and D. K. Frost of The Mattison Machine Works, on "Theory of the Mot-O-Trol" by W. I. Bendz of Westinghouse and on "Electrical Equipment for Automatic Tools" by G. B. Carson of The Cleveland Automatic Tool Co. At the meeting of the other group, F. D. Newbury, vice president of Westinghouse, talked on "Postwar Plans" and E. L. Spray of Westinghouse discussed "The Expectations of a Machine Tool User." Discussion of Mr. Spray's paper was led by W. P. Kirk, vice-president and sales manager of Pratt & Whitney Division, Niles-Bement-Pond Co.

James Y. Scott, president of the National Machine Tool Builders' Association and president of The Van Norman Company, B. W. Clark and A. H. Phelps, Westinghouse vice-presidents, and C. B. Stainback, manager of Westinghouse's industrial department, were speakers at a luncheon on Tuesday, while Frederick S. Blackall, Jr., president of the Taft-Peirce Manufacturing Co., was guest speaker at the annual dinner held Tuesday evening.

The Tuesday afternoon session of the Forum was given over to a discussion of postwar standards for electrical equipment on machine tools, led by Tell Berna, general manager of the National Machine Tool Builders' Association. Prepared discussions were presented by E. J. Rivoira of The Cincinnati Milling Machine Co. and R. H. Clark of Warner & Swasey Co.

Rising Munitions Output Schedule is Announced

WASHINGTON—Output of munitions during March rose 3 percent above the February level, ending a three-month downtrend which was scheduled for the early part of the year.

From March onward, the over-all schedule rises throughout the summer. The major problem in war production for the next few months will be to keep the level of actual output abreast of the increasing schedule as set by the armed forces.

Production of aircraft, airborne electronics equipment, large trucks, most types of Naval combatant ships, landing craft and heavy artillery are scheduled to rise 25 percent by the end of the year.

Output of most ground Army items, destroyer escort vessels, Liberty ships, and radio will decrease.

That meeting the set goal is going to tax the resourcefulness and cooperativeness of both management and labor is illustrated by the fact that, during March, actual output in the critical uptrending programs was up 6 percent, while the required gain therein was 8 percent.

G. A. Caldwell

L. W. Scott Alter

D. K. Frost

C. B. Stainback

Tell Berna

F. S. Blackall, Jr.

Wartime Washington

Navy Geared to Distance

Our naval authorities say that the war in the Pacific is one from now on of licking the distances of the Pacific Ocean more than of defeating the Japanese. The latter cannot be done until the former is accomplished. The supply problem is on a colossal scale. To carry high octane gas alone to flyers in the Pacific areas requires a surprisingly large number of ships. The whole conception of naval warfare and of naval logistics has changed. The British navy for example was built on a conception of having land bases available roughly every 1,000 miles. The U. S. navy has broken away from that traditional conception and has mobile bases so that the Navy itself is relatively independent of land bases. Such a conception seemed impossible a few years ago, but it is proving practical every day that the war continues. To carry out such a conception, it is necessary to have everything done on the basis of precision planning.

Manpower Troubles Maintenance

The railroads are short 104,000 men and are desperately trying to find maintenance crews. A plan is afoot to import some 40,000 Mexicans and some talk is on about using prisoners of war. Railroad officials are bitter about the drafting of men needed to maintain carrier service. Incidentally, prisoners of war are being employed in the sorting of scrap brought back to this country from the battlefronts. In this country today are 183,000 prisoners of whom 130,000 are Germans. About 67 percent of the prisoners are at work. By international law officers are not required to work unless they so choose.

Tool Survey Nears Completion

A survey to determine the demand for machine tools and the percentage of the industry's capacity which is available for tool construction is nearing completion, WPB's Tools Division has reported. Replies to the questionnaire sent all tool builders were to have been in early in May.

Information sought included a list of products or categories of products other than machine tools for which a builder has orders; value of such orders, including those covered only by a letter of intent but excluding products to be made with facilities never used for tool manufacture; percent of capacity used for manufacture of tools or parts; percent of capacity used for products other than machine tools; percent of capacity ever used for tools which is standing idle, and estimated dollar billings of war products other than machine tools for March, April, May and June, 1944, which are to be met from capacity devoted at any time to tool-making operations.

Pressure Stops Prohibition

Congressional and other pressures have killed the flat prohibition by WPB against increasing non-war production in areas undergoing or in prospect of acute labor shortages, but it will be replaced by a new standard. (AM, April 27, page 128 g)

WPB Chairman Donald M. Nelson revoked the order, issued during his absence, and said a substitute would be issued which would be more specific and would omit certain "essential" civilian programs, apparently including electric irons, alarm clocks and work gloves.

Will Make More Irons

First effect of the revocation is expected to be a substantial increase in the number of irons which will be manufactured, although it was not immediately clear that the program would be restored to the 2,000,000-unit figure originally authorized. This figure was slashed to 200,000 by the directive limiting production in War Manpower Commission's Class I and II areas to the level authorized or attained in the first quarter of 1944, whichever is lower. Nelson said only that as many irons as possible would be manufactured.

Later-announced production quotas added 193,625 to the 200,000. The recent increase constitutes assignments of quotas to three manufacturers: Westinghouse Electric and Manufacturing Co., Mansfield, Ohio, 157,000; Dominion Electric and Manufacturing Co., Mansfield, Ohio, 35,000, and the New York Pressing Machine Co., New York City, 1,625.

NEW CPRB CHAIRMAN NAMED

WASHINGTON—Appointment of Mason Britton as United States member and chairman of the Machine Tools Committee of the Combined Production and Resources Board, to succeed Ralph E. Flanders, was announced by CPRB.

Mr. Britton is vice chairman of the Board of Directors of the McGraw-Hill Publishing Co. and has been associated with the publishing firm since 1901. He served as chief of the Tools Section of the Office of Production Management, which preceded the War Production Board. Mr. Flanders, whom Mr. Britton succeeds, is president of Jones and Lamson Machine Co. and recently became president of the Federal Reserve Bank of Boston.

Catapult Cannon—Blank shells fired in one of the catapult guns, which a Navy ensign and a Westinghouse workman are shown inspecting, cause rapidly expanding gases to push against a piston; this yanks a cart along the catapult track and the scouting plane sitting thereon is tossed into the air from the warship deck

NAWPC—ACC Joint Conference Discusses War and Postwar Plans

Top executives of the nation's largest airplane manufacturing companies gather during the joint NAWPC and ACC conference. Seated, l. to r., J. H. Kindelberger, president, North American Aviation, P. G. Johnson, president, Boeing Aircraft, L. C. Goad, vice president, General Motors and general manager, Eastern Aircraft Division, Harry Woodhead, president, Consolidated Vultee, LaMotte T. Cohu, chairman, Northrop Aircraft and Guy W. Vaughan, president, Curtiss-Wright. Standing, same order, Alfred Marchev, president, Republic Aviation, J. Carlton Ward, Jr., president, Fairchild Engine and Airplane, Glenn L. Martin, president, Glenn L. Martin Co., T. Claude Ryan, president, Ryan Aeronautical, L. D. Bell, president, Bell Aircraft, Robert E. Gross, president, Lockheed Aircraft, Eugene E. Wilson, vice chairman, United Aircraft, Ernest R. Breech, president, Bendix Aviation and Reginald E. Gillmor, president, Sperry Gyroscope

LOS ANGELES—More air power is the goal of America's aircraft industry. Not, necessarily, more airplanes but bigger and better ones was the principal topic of the joint meeting of the National Aircraft War Production Council and the Board of Directors of the Aeronautical Chamber of Commerce, here, April 24 to 26.

Plans were laid for expanding the industry's program for cooperation between airplane manufacturers. Top executives of companies which build more than 90 percent of U. S. warplanes sat down with government officials to discuss better methods of building superior craft.

Choose NAWPC Officers

Officers of the National War Production Council were elected: **President,** Victor Emanuel, president, Aviation Corp.; **vice president,** J. H. Kindelberger, president, North American Aviation, Inc.; **directors,** Donald W. Douglas, president, Douglas Aircraft Co.; P. G. Johnson, president, Boeing Aircraft Co.; L. C. Goad, vice president, General Motors and general manager, Eastern Aircraft Div.; and Alfred Marchev, president, Republic Aviation Corp.

Lt. Col. John Wood, Office of the Secretary of War, stressing the necessity of using younger men in the armed forces to decrease casualties, said that less than two percent of the under-26 age group will be deferred permanently. Greater pooling of engineering skill and manufacturing "know-how" was urged, along with expanded use of women, 4-F's and over-age men.

Manpower Better Utilized

Statistics of member companies of the West Coast Council revealed that manhours of direct labor per pound of airframe weight, which stood at an average of 1.67 in January, 1943, had been lowered to 0.87 by December of the same year.

Reemployment of veterans is expected to be an acute future problem. Thousands of young men have gone directly from airplane plants into the service—80,000 from the west coast plants alone—and the companies are gravely concerned over their obligation to restore these young men to their jobs when they return to civil life.

In discussing the future schedules for airplane construction, Dr. A. E. Lombard, Jr., of the Aircraft Resources Control Office, WPB, praised the industry for the development and preparation of manufacture of new military models in advance of contracts. He told of the maintenance, since the war began, of a strategic schedule based on military needs, and a production schedule, based on capacity; we have now reached the point, he said, where production is based on actual combat needs.

Dr. Lombard said that the program of military requirements is based on a weekly reviewed estimate of the date for the defeat of Germany, and that a definite plan for switching the emphasis from planes of the type required in Europe to those required in the Pacific war has been made.

Plane Makers May Plan

Discussing WPB Order P-43, recently issued, Dr. Lombard revealed that the development department of an airplane manufacturing company may be called a "laboratory," within the meaning of the order, and that it is now permissible for material to be used for the purpose of developing pilot models of articles for postwar production, provided there is no diversion of needed manpower from war goods.

ACC Lays Plans

In a move that may prove of historic significance, the board of directors of the Aeronautical Chamber of Commerce, formally resolved for the early formulation of an American Air Power Policy, embodying four fundamental elements: 1. Maintenance of military air forces at such strength and in such state of readiness as to preclude a successful assault upon our country or its possessions; 2. Acquisition and maintenance of air bases essential to our security and that of our overseas trade; 3. The orderly and economic expansion of domestic and international air transport and private flying; and, 4. The preservation of a strong aircraft manufacturing industry.

ACC Officers Elected

To guide the work of the Chamber, the following officers and executive committee of the Board of Governors were selected: **President,** James P. Murray, vice president, Boeing Aircraft Co.; **vice presidents,** L. D. Bell, president, Bell Aircraft Corp., and LaMotte T. Cohu, chairman of the board, Northrop Aircraft; **secretary,** Harrison Brand; **treasurer,** John E. Morgan; **chairman of the board and of the executive committee,** Eugene E. Wilson, vice president, General Motors; **vice chairman,** Donald D. Douglas; **board members,** Ernest R. Breech, president, Bendix Aviation Corp., P. G. Johnson, president, Boeing Aircraft Co. and Glenn L. Martin, president, Glenn L. Martin Co.

Spotting the Air News

Hope Transcends Facts

There is something about human hope and ambition that outweighs the cold calculations of engineers. Twelve or 15 manufacturers of light airplanes are going right ahead with plans to sell personal machines in mass number despite expert calculations that a sales rate of 20,000 to 40,000 per year cannot be reached for five to ten years. It must be said for the hopeful school that, when the automobile business was where aviation now is, no engineer could have figured how every fourth or fifth person could own a car.

Personal plane builders believe that if their plan to dot the country with small cheap air fields is successful, the utility of conventional fixed-wing planes will be greatly improved. They are striving to squeeze the price of a four-seat family plane down to $2,000 or $1,500. They are making progress in a campaign to simplify government certification of plane types and pilots. They are seeking an adequate distribution and servicing system, and trying to unite in a solid front for a conservative sales policy—meaning they will not oversell the planes utility.

Weather will make planned flights uncertain for some time to come. But the plane industry will make a strong appeal to all lines of business, claiming many ways in which light and medium aircraft can be owned and operated with profit. Many of the heavier "light" planes will be suitable for use by "feeder" airlines, which may be numerous despite warning by the Aeronautics Board that they will not pay. Local and national politicians may see to that.

See Taxi and Fly-Yourself

Still more attractive to many men, as either private flyers or business men, is the prospect of extensive air taxi and fly-yourself services. Both will provide airplane trips without the responsibility of plane ownership—the former without trouble of learning to fly. Taxi trips of a few hundred miles, starting at a handy nearby air field, and costing about the same as train or air transport fare, will be attractive to many persons. The operation of such services and of small air fields will get public support as careers for thousands of returning military airmen and mechanics.

Military Will Lead Sales

Biggest market for aircraft by long odds will be military aviation. Army and Navy air forces both will try to stay big. The aircraft industry already has proposed a postwar program of 50,000 military planes a year. Of course, it will depend on what kind of peace follows war. The taxpayers will hammer air power down unless they are scared of foreign aggression. But whatever they hammer it down to, plus export to many foreign air powers, will make a good market compared with prewar volume.

Navy Is Mobile

Few people realize that the Navy is fighting a new kind of war, that the old system of total dependence on fixed bases has been abandoned and that the new Navy is mobile. It has every kind of supply and service with it, afloat. Little known also is the fact that carrier-based planes are now more than a match for land-based planes. Design improvements did it. Land planes must attack shipping at long range. They are loaded with fuel to return home. Light-fueled carrier planes intercept them at short range. Jap land-based airpower has hardly scratched the U. S. Navy.

To Revitalize ACC

The Aeronautical Chamber of Commerce of America, devitalized two years ago when the Aircraft War Production councils were set as wartime aircraft trade associations, is now being rehabilitated. The councils (East, West and Central, and National, the parent of all three), cannot meddle in politics. Statements of policy by the industry on termination of contracts, disposition of government owned plant, and of government owned airplanes, especially military transport planes convertible to commercial use, are long overdue. Legislation on those matters is getting well along toward crystallization. That is why the Aero Chamber is being revived.

Chief cause of the delay was a long search for a high-octane executive to run it. The Chamber faces endless troubles. Engine, airframe and propeller producers do not agree—except in a common wish to throw out the members who make spark plugs, batteries and the like. The latter are rapidly forming trade associations of their own.

Veterans a Problem

A real hot potato for the aircraft industry—among others—is the handling of returning veterans. Many of the disabled and neurotic cases are being discharged in California, where so much of the war production is of planes. The trend is increasing, as it will continue to do when the action gets hotter in the Pacific. The West Coast producers have 80,000 people in the service, and with an estimated 30,000 postwar jobs in plane plants, the problem is obvious. On the other hand, the producers may not be unaware of the leverage value of having a bunch of veterans clamoring to work in plane plants during the postwar period.

WOMEN ABSENT OFTENER

CINCINNATI—Women war workers are still leading in absenteeism, but their record is improving, George A. Seyler, vice president of the National Metal Trades Association reports.

According to an NMTA survey, average male worker was absent 8 times a year for 3 days each; the average woman, 12 times for 2.6 days each. Personal illness caused 28.4 percent of the absences; faulty transportation 31.7; AWOL, 21.8.

Pigeon Toes—Technical difficulties eliminated use of ordinary retractable landing gears, so Glenn L. Martin Company engineers designed for the B-26 Marauder one which withdraws almost straight up like a pigeon's feet. The gear is safer in that it can be lowered by gravity, while added strength is provided by two pivot points and double locking features

Names in the News

Electronic Motor Controls Seen at Reliance Meeting

CLEVELAND—A system of program control which operates electronically and is not affected by temperature was among the electronic control devices for variable speed machine tool operation demonstrated by Reliance Electric and Manufacturing Company at a "Seeing is Believing" meeting held at its plant on April 29. Attended by about 50 repesentatives from a number of machine tool plants, this meeting included a trip through the company's Cleveland plant, during which more than a score of applications of Reliance electrical equipment to lathes, boring mills, grinders, drills, balancing machines, and other machine tools were demonstrated while the equipment was in production on war goods. The meeting was opened with a short address by C. L. Collens, President of Reliance, who announced the development by his company of an electronic unit for supplying excitation to their all-electric adjustable-speed (V-S) drives which should have considerable use in the postwar reconversion to civilian production.

Advocate Universal Color And Symbol Code for Plants

NEW YORK—Industrial hazards of similar natures and all industrial safety equipment would be identified by a universal system of colors and symbols under a "Safety Color Code for Industry" advocated by E. I. du Pont de Nemours & Company. Details were explained by company officials at a recent press meeting.

Under the plan suggested, which is offered free to all takers, six colors and six symbols would be standardized upon by all plants, in much the same manner as railroad signals have been made uniform throughout the country. Colors chosen are "high-visibility yellow" for identifying stumbling, falling and tripping hazards; "alert orange" to mark cutting or crushing dangers; "safety green" for all safety equipment, except fire extinguishers, identified by "fire protection red"; "precaution blue" to warn against operating machines and equipment shut down for repairs, and, "traffic white" to mark aisles, storage areas and rubbish containers.

It was explained that symbols, in proper colors, would serve to identify various locations from a distance. Too, symbols would serve as signals for workers afflicted with color-blindness. Each symbol, of course, would be distinctive in shape and would be painted on the wall above the hazard or equipment identified, and on the floor below.

In explaining the color code, du Pont officials stated that it had already been tried in several plants with satisfactory results, and had been given the blessings of the National Safety Council.

J. H. Marks

James H. Marks has been named executive vice president of the Packard Motor Car Company with duties to be designated by the president as the need arises. Mr. Marks joined Packard in 1916 as plant engineer, after eight years as superintendent of the building and grounds department at the University of Michigan. Following this, he was, successively, Twin-Six production manager, industrial engineer, purchasing manager, and vice president since 1940.

William P. Gwinn has been elected general manager of the Pratt & Whitney Aircraft Division, Niles-Bement-Pond Company. He joined the division in January, 1927 and has been acting general manager for several months.

R. A. McCarty, vice president of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in charge of subcontracting activities, has been granted a leave of absence and will accept the post of special assistant to Maury Maverick, chairman and general manager of the Smaller War Plants Corp., Washington. In his absence, **Andrew H. Phelps,** vice president in charge of purchases and traffic for Westinghouse, will assume the responsibilities of Mr. McCarty's job.

John Avery of Allis-Chalmers was recently appointed manager of their blower and compressor department to succeed **G. L. Kollberg,** who is retiring after 47 years with Allis-Chalmers. Mr. Kollberg will continue with the company as consultant and advisor on engineering matters. Mr. Avery has been with Allis-Chalmers for 13 years and since 1935 has been assistant manager of the blower and compressor department.

Robert G. Owen has joined the Zephyr Manufacturing Co. of Inglewood, California as general manager. Previously, Mr. Owen was with the Vega Aircraft Co. in charge of standard and attachment tooling and later with the Aircraft Tool Co. of Los Angeles.

E. E. Clark

V. G. Roddy

E. E. Clark, of the American Screw Company, Providence, Rhode Island, has been named president of that company, while **V. J. Roddy** is the new vice president of the concern.

GE Changes — L. to r: C. J. Koch, who will succeed H. M. Maxwell, manager of the Induction Motor Division, retiring after 42 years of GE service; M. H. Wells, designing engineer of the same division, who has been with the company for 43 years, will be followed by F. D. Phillips. All four men started as student engineers at GE and have been members of this division for many years

Wallace Johnson

Wallace Johnson has been appointed general sales manager of the Joshua Hendy Iron Works, Sunnyvale, California. Mr. Johnson joined the Hendy organization in November 1942 and since then he has been: assistant to the president at the Crocker-Wheeler Division, Ampere, New Jersey; administrative head at Sunnyvale; and, since June 1943, general manager of the Pomona Pump Division, Pomona, California. Prior to 1942, Mr. Johnson was, successively, sales engineer for the Moore Machinery Company, sales manager and chief engineer of the Autometric Machine Tool Company and general manager of the Production Engineering Company, Berkeley, California.

F. H. Herndon

F. H. Herndon, assistant manager for the last ten years of the Coal Stoker Division of the Link-Belt Company, Chicago, Ill., has been appointed manager of that division with full charge of its activities and personnel. K. C. Ellsworth, former eastern stoker division manager at New York, has been named sales manager of the stoker division. Both men will have their headquarters at the Caldwell plant, Chicago. Mr. Herndon came to Link-Belt from the Modern Coal Burner Co. after having been with the Peabody Coal Co., for several years. Mr. Ellsworth has been associated with Link-Belt in numerous capacities with headquarters throughout the country.

John M. Smith

John M. Smith, general manager of manufacturing for the RCA-Victor Division of Radio Corporation of America, has resigned to join P. R. Mallory & Co., Inc., Indianapolis, Ind., as vice president in charge of manufacturing. Mr. Smith has been associated with the Radio Corporation of America for the last fourteen years and prior to that was with the Incandescent Lamp Division of General Electric Co., Nela Park, Cleveland, for sixteen years.

Fred H. Haggerson

G. F. Eglinton

George F. Eglinton has assumed the presidency of the Lincoln Park Industries, Lincoln Park, Mich. He succeeds Albert A. Robinson who is now chairman of the board.

Fred H. Haggerson has been chosen president of Union Carbide and Carbon Corporation to succeed **Benjamin O'Shea,** who now becomes chairman of the board. Mr. Haggerson, who has been associated with the Union Carbide and Carbon Corporation for 25 years, is a former vice-president and director of the company.

Thomas F. Wilson, formerly assistant to the senior vice president, has been appointed assistant to the president of the American Car and Foundry Co. In his new post Mr. Wilson will continue to assist the recently elected president of a.c.f., **Frederick A. Stevenson,** the former senior vice president of the company, who retains general control in all a.c.f. plants.

O. J. Neslage

J. A. Drain, Jr.

J. A. Drain, Jr., recently was elected vice president in charge of product engineering, research and development for the Sullivan Machinery Company, Michigan City, Indiana. Mr. Drain is the former president of the Stefco Steel Company and, more recently, assistant to the president of the Sullivan Company.

O. J. Neslage of the Sullivan Machinery Company, Michigan City, Indiana, has been elected vice president in charge of sales in the United States and Mexico. During the past year, Mr. Neslage was general sales manager and prior to that served as branch office manager in various district offices in the United States and Mexico.

Arthur J. Miller

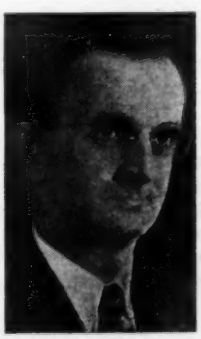
R. F. Onsrud

R. F. Onsrud was elected president and general manager of the Onsrud Machine Works, Inc., Chicago, at a recent meeting of the board of directors.

Arthur J. Miller has been elected president of the Chicago Wheel & Manufacturing Co., producers of mounted wheels, grinding wheels, and allied abrasive products, to replace his father, the late Henry E. Miller, who founded the company in 1894. Mr. Miller joined the company in the special formula department in 1915 and in 1926 he was elected treasurer of the firm. He is responsible for many developments in use in the abrasive industry.

J. A. V. Scheckenback, recently elected vice president of the American Car and Foundry Co., has been placed in charge of manufacturing and, in addition, will have charge of improvements and maintenace in all a.c.f. plants.

Walter White, former plant manager of the Pittsburgh Steel Foundry Corp., Glassport, Pa., has been named vice president in charge of production and **E. S. Weidle,** former general sales manager, has been appointed vice president in charge of sales for the company.



James F. Reid

James F. Reid, former deputy chief of the Alloy Steel Branch of the War Production Board, has been appointed production manager of the Timken Roller Bearing Company of Canton, Ohio. Mr. Reid had been production manager of the Steel and Tube Division of the Timken Co. before obtaining a leave of absence in May, 1942 to join the WPB. His activities and responsibilities in his new capacity extend to all divisons of the company. Mr. Reid has been with the Timken Co. twenty-five years—fifteen years as the Production Manager of the Steel and Tube Division.

Lou F. Kinderman of the Rail & Industrial Equipment Co., New York and San Francisco, has been named sales manager of the company with headquarters in New York. For many years, Mr. Kinderman has been associated with the steel industry in the construction of mills and as a sales representative.

Laurence C. Hicks, a member of the Allegheny Ludlum Steel Corporation's research department since 1933, has been appointed metallurgical engineer and associate director of research in the Magnetic Products Division of that company.

BUSINESS ITEMS

Link-Belt Company, Pacific Division, announces the opening of a sales office and warehouse at 151 Lincoln St., Spokane 8, Washington, with **Holmer A. Garland** in charge.

The Climax Molybdenum company has opened new offices at 624 Fisher Building, Detroit, Mich., to handle the company's sales and service work in the Michigan, Indiana and Toledo district. **V. A. Crosby**, who has been associated with the company for the last 10 years, will be in charge of the office.

The Rome Manufacturing Company Division of Revere Copper & Brass, Inc., Rome, N. Y., has announced the opening of a New York sales office in the New York Central Building, Room 1523, 230 Park Ave., under the managership of **Donald G. Noakes.**

Farrel-Birmingham Co., Inc., of Ansonia, Conn. and Buffalo, N. Y. is moving its New York offices from 79 Wall Street, where it has been located for many years, to 3700 Chrysler Building.

Fieldstone Tool & Machine Co., formerly at 5845 Broadway, have moved their offices and plant to larger quarters at 1760 Morris Ave., New York 57, N. Y.

The Selas Company announces a change in its corporate name to the **Selas Corporation of America.** This change does not imply any change in the organization, service, personnel or objectives of the company.

The Netherlands Purchasing Commission announces the removal of its offices from 10 Rockefeller Plaza, New York, N. Y. to 41 East 42 St., New York 17, N. Y.

Manufacturers Screw Products Co., Triskett Rd. and W. 127th St., Cleveland, Ohio, has been purchased by **James R. Ward**, formerly of the Parker Appliance Co.

Indianapolis Machinery & Supply Co., Indianapolis, Ind., has opened a New York office at 44 Whitehall St. under the name of the **Indianapolis Machinery Export Co.** to act as an export office for eastern sales. The new manager of this eastern division is **Stanley H. Rose.**

Whitman & Barnes recently opened a new branch office at 2305 E. 8 St., Los Angeles 21, Calif., to supply the demands of west coast tool users. **E. L. Foreman**, former manager of the New York branch, is the new west coast manager.

The Kron Company of Bridgeport, Conn., makers of scales, has been purchased by the Yale & Towne Manufacturing Co., Chrysler Building, New York.

Hole Engineering Service, Detroit, Mich., has recently moved to larger quarters at 13722 Linwood Avenue.

Joseph Satin Co. announce their removal to larger quarters at 912 Bedford Ave., Brooklyn 5, N. Y.

OBITUARIES

Ernest Easthope, 91, co-founder of Easthope Brothers, marine engine manufacturers, of Vancouver, B.C. died recently. In 1902 he helped found Easthope & Sons, but he has not been active in the business for the last 35 years when his sons took over the renamed company.

J. Byron Henry, long a member of the steel casting industry, recently passed away at his home in Wheeling, W. Va. For many years, Mr. Henry was a member of the Union Steel Casting Co., Pittsburgh, where he rose to the position of vice president and general superintendent. In 1930 he left the company to join the Standard Steel Works, Burnham, Pa., and in 1933 he joined the Continental Roll & Steel Foundry Co. as a member of their Wheeling plant. He remained with this company until his death.

Thomas B. Hogben, manager of the New York office of the L. S. Starrett Co., passed away recently. Mr. Hogben had been associated with the Starrett Co. for the last 35 years. For many years he was assistant in the New York office to the former manager, William Greene, who is now vice president and general sales manager in the home office, but was made manager over two years ago.

John C. Markley, 52, died recently. He was chief engineer of the navy and marine division of Babcock & Wilcox, Co., Barberton, Ohio.

Clement O. Miniger, founder and chairman of the board of the Electric Auto-Lite Company, died recently at his home at the age of 69. He organized the company in 1911, with himself as secretary and treasurer. Three years later, he became president and general manager of the company. He retained this position until 1934 when he was elected chairman of the board.

Philip M. Sharples, founder of the Sharples Co., Philadelphia and manufacturer of the first cream separator in the United States recently died at the age of 86. The Sharples Co. has been headed by two of Mr. Sharples' sons since his retirement ten years ago.

Michel Nigro, inventor and mechanical engineer, who was well known in the machine and wire spring industries, died in Worcester, Mass. at the age of 62, having retired five years ago because of ill health.

MEETINGS

American Electroplaters Society. Annual meeting. Hotel Cleveland, Cleveland, Ohio. June 12-14.

American Gear Manufacturers Assn. Annual meeting. Westchester Country Club, Rye, N. Y. May 22-24.

American Iron & Steel Institute. Waldorf-Astoria Hotel, New York, N. Y. May 25.

American Machine Tool Distributors' Assn. War conference. French Lick Springs Hotel, French Lick, Ind. May 25-26.

American Management Assn. Annual meeting. Hotel Pennsylvania, New York, N. Y. June 8.

American Society for Testing Materials. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. June 26-30.

American Society of Mechanical Engineers. Semi-annual meeting. William Penn Hotel, Pittsburgh. June 19-22.

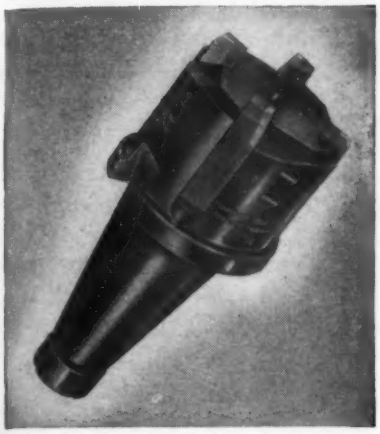
Society of Automotive Engineers National Diesel-Fuels & Lubricants Meeting, Hotel Knickerbocker, Chicago, Ill. May 17-18.

Society of Automotive Engineers National Transportation & Maintenance Meeting, The Bellevue-Stratford, Philadelphia, Pa. June 28-29

Society of Automotive Engineers National War Materiel Meeting, Book-Cadillac Hotel, Detroit, Mich. June 5-7.

Society of the Plastic Industry. Annual meeting. Edgewater Beach Hotel, Chicago, Ill. May 11-12.

Shop Equipment News



Kennamill cutter

Kennamill Cutters for Steel Are Available in Four Sizes

A line of inserted blade cutters, known as Kennamills, for step milling of steel has been developed by Kennametal Inc., 103 Lloyd Ave., Latrobe, Pa. The cutters are available in four sizes: 2 in. with three blades; 3, 4 and 5 in. each with four blades. The 2 and 3 in. sizes have taper shanks to fit No. 40 and No. 50 spindles; while the 4 and 5 in. sizes have taper shanks to fit a No. 50 spindle. All sizes used the same replaceable Kennametal-tipped blades. Two sets of blades are supplied with each cutter head.

Tool and cutter grinders are not necessary since the blades may be removed from the head and resharpened to a templet on an adjustable table carbide grinder.

Boice-Crane Wet Grinder For Speed of 120 R.P.M.

A wet grinder has been designed by Boice-Crane Co., 935 Central Ave., Toledo, Ohio. Made for proper grinding speed of 120 r.p.m., this grinder throws no water, it is claimed, and may be belted to a 1,750 r.p.m. motor, lineshaft or gas engine. It has a concentric running 10-in. sandstone wheel, centered on its arbor so as to grind a straight bevel from heel to edge without weakening tool temper.

Bullard Produces Four-Spindle Mult-Au-Matic Machine To Handle Work 34-in. in Diameter by 23-in. in Height

Larger than any machine of its type ever before built is the 34-in. Mult-Au-Matic made by The Bullard Company, Bridgeport 2, Conn. This four spindle machine handles work up to 34-in. in diameter and 23-in. in height. It has three working and one loading station.

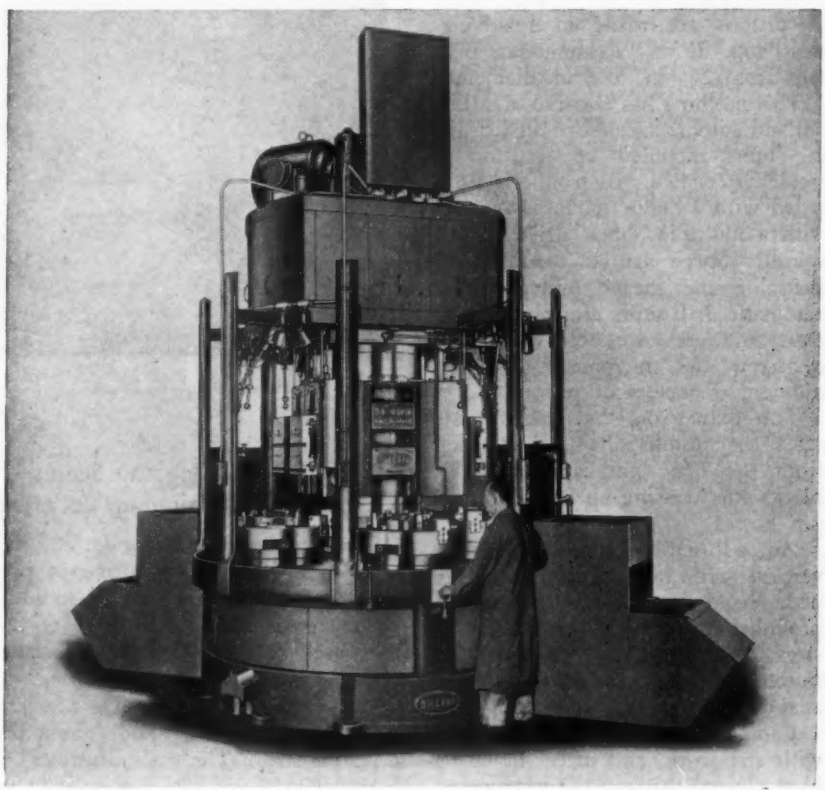
The machine has four spindles and is provided with six heads, two at each working station. Each head has independent feed and each provides vertical, horizontal or angular motion, so three working stations can accomplish tasks formerly requiring six working stations. All heads are hydraulically counterweighted.

An adjustable column, carrying the toolheads permits moving up and down of all six heads as a unit. This eliminates excessive head and tool overhang and makes possible a quick change over from low to high work.

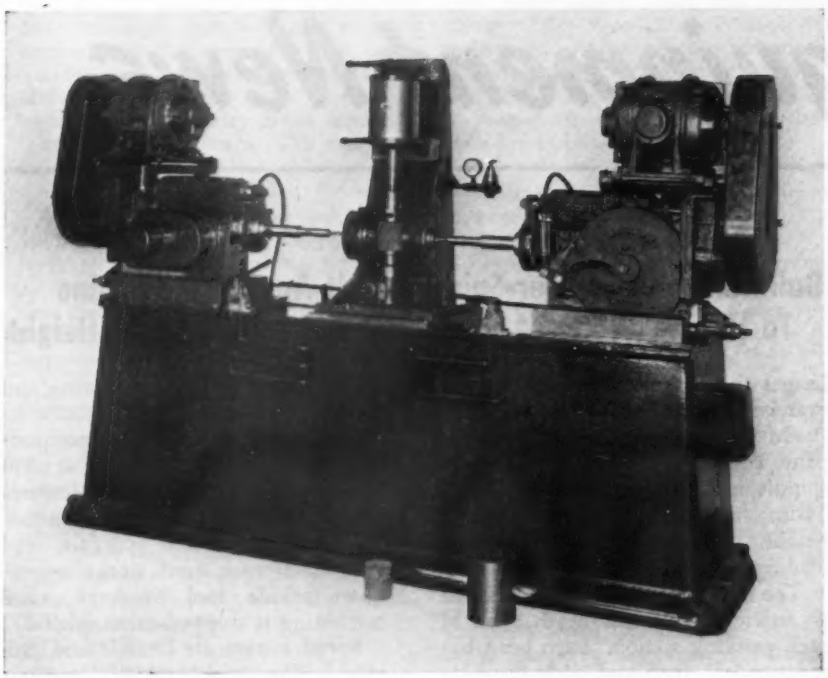
A specially designed indexing and locking mechanism gives smooth indexing and provides rigid positioning and locking of the carrier at completion of each index. Other features include pushbutton controls for actuation of toolslides and hydraulic feed kick-out at each feed works to prevent carbide tool breakage when machining is stopped uncompleted.

Speed ranges are flexible and provide a low speed range for slow, heavy cuts and a high speed range for smaller diameters. The machine is so designed that one or two spindles may be in low speed while the others are in high range or vice-versa.

Projected floor space for the machine is 190×190 in., which includes two coolant tanks, chip boxes and motors. It stands 165 in. high to top of drive bracket and weighs 80,200 lb. without tooling.



Bullard 34-in. Mult-Au-Matic



Millholland drilling machine

Millholland Drilling Machine Designed for Piston Pin Holes

A double-end piston drilling machine has been produced by W. K. Millholland Machinery Co., Indianapolis 5, Ind. The machine was designed primarily for drilling piston pin holes in job lots for replacement manufacturing where various sizes of pistons are made in relatively small lots. It will accommodate pistons from 2¾ in. to 6 in. diameter.

This machine has two No. 4 Millholland automatic cam-operated drilling units mounted opposed on a welded steel bed. Each unit is provided with a motor mounted on top with a multiple V-belt drive to the spindle. Speed changes are made by changing the sheave pulleys. The automatic drill units are mounted in bases and are adjustable by means of screw and micrometer dial for different diameters of pistons.

The fixture on the machine locates the pistons in usual manner from the open end and with V-blocks for squaring up by the piston pin bosses.

An adjustable center post with vertical screw adjustment by means of a handwheel inside the bed is provided to accommodate different sizes of pistons. An air-operated clamp secures the piston against the adapter plate on the open end.

Cams bring the tools in contact with the work, and after the drills have cleared through the pin bosses, the spindles are returned to the starting position by means of an air return cylinder on top of each unit.

The drilling machine is semi-automatic in operation and is controlled by operation of two valves, one for clamping and one for starting the cycle.

Howe weighing scale

Howe Offers Weighing Scales For Check-Weighing, Counting

Howe Scale Co., Rutland, Vt., has added a complete new line of predetermined weighing scales. In addition to packaging, these scales can be used for check-weighing, balancing, counting and compounding.

The models offered cover a variety of shapes, capacities and commodity platter sizes. The scale illustrated is Model 1520 and has capacity of 11 lb. and 9×9 in. platter.

DoAll Set of 37 Gage Blocks Is Offered in Two Qualities

An economy set of 37 DoAll gage blocks is offered in two qualities by Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis 4, Minn. The case measures 7½×4×2 in.

Set A, "inspection quality", is guaranteed for height, flatness and parallelism accuracy within ±0.000004 in. at 68 F. Set B, "working quality", provides accuracy within 0.000008 in. at 68 F.

The set includes two 0.050 in. wear blocks in addition to the five standard series of gage blocks. The first

DoAll set of 37 gage blocks

series consists of nine blocks: 0.1001 in. to and including 0.1009 in. in increments of 0.0001 in. Nine blocks, 0.101 in. to and including 0.109 in., in increments of 0.001 in., are included in the second series. The third is nine blocks: 0.110 in. to and including 0.190 in., in increments of 0.010 in.; five blocks in the fourth series: 0.100 in. to and including 0.500 in., in increments of 0.100 in.; and three blocks in the fifth series: 1.0, 2.0 and 4.0 in.

Wheelco Chronotrols Unit Controls Heating or Cooling

The Chronotrols instrument, to enforce any desired heating or cooling program, has been developed by Wheelco Instruments Co., Harrison & Peoria Sts., Chicago 7, Ill. This instrument is offered in 25 models, including ten for proportioning control and others for two-position on-off and three-position on-intermediate-off control for high and low temperature applications. Thermometer models are available in recording as well as indicating types.

Chronotrols provides automatic

"The efficiency of lathes has increased so greatly we replace old types quickly. In measuring efficiency, we find L & S Lathes pay dividends first."

UNDER the stress of wartime production you may not have had time to thoroughly analyze the quality and quantity of lathe output in your shop. Production lathes in continuous use for several years become a liability under three shift operations, unskilled handling and increasing down-time. Add lowered output, failing accuracy, mounting costs and upset schedules — and you have a bad condition, bound to grow worse if neglected.

Check over your production sheets with Lodge & Shipley Engineers. Find out in actual dollars and cents the economies you can make by replacing old, worn lathes with new and better ones. Our experts can show you, too, how L & S *"engineering foresight"* will make your lathes adaptable to the new competitive and production problems sure to come.

ENGINE
TOOL ROOM
AUTOMATIC
OIL COUNTRY LATHES

Prepare for the Coming Battle of Markets!

When competition grows keen, new and better machine tools will be the chief factor in holding costs to a competitive level. Lodge & Shipley, with 52 years of specialized lathe experience, can give your turning operations the "short cut" to lower costs. Save later by planning now!

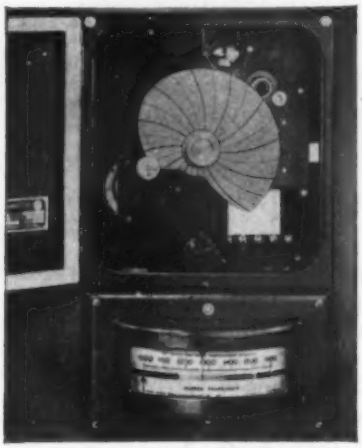
The No. 3-A Duomatic (illustrated) is a full automatic lathe permitting dual operations—front and rear—for quantity production of work. With the 3-A Duomatic any combination of turning, straight or angular "in" or "out" facing cycles are obtainable, front or rear, singly or together. Diameters and lengths are automatically controlled, insuring exact duplication of sizes. The 3-A Duomatic handles a wide variety of work in large or small quantities with equal efficiency. Write for Bulletin 601 FL for complete data.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, 25, OHIO, U. S. A.

L & S LATHES

temperature regulation, regardless of changes in temperature desired for a given process or application. Temperature cycle desired is cut on a disk and its rotation by a synchronous motor moves the temperature setting lever of the control instrument. Frequency of oscillating current flowing between pick-up coils, mounted on the temperature control setting index, is changed when a control flag on the pointer or pen arm is moved between the coils by a temperature rise,



Wheelco Chronotrols unit

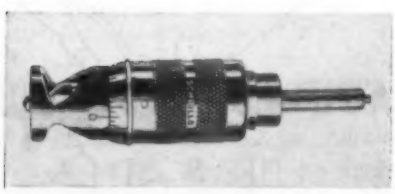
or is moved from between the coils by a temperature drop. Frequency change in control circuit governs the output current of a vacuum tube acting to open relay contact which in turn operate fuel valves or switches.

Schrillo Aero Countersink Has Positive Lock Feature

Schrillo Aero Tool Engineering Co., 8715 Melrose Ave., Los Angeles 46, Calif., has developed an adjustable micrometer stop countersink. The unit has adjustments in increments of 0.001 in. without use of any tool.

A positive lock prevents loss of adjustments when in use, and a self-contained knockout pin facilitates removal of taper shank cutters.

An added feature of the countersink is the fact that a factory rebuilding service is available.



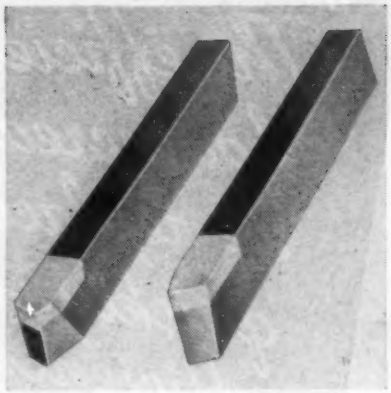
Schrillo countersink

Haynes Stellite Tipped Tools Designed for Machining Steel

Haynes Stellite Co., Kokomo, Ind., has designed two new styles of tipped tools for machining steel. They are designated as Style P and Style Q and consist of a cutting tip of Stellite 98M2 cobalt base alloy brazed or butt-welded to a steel shank. Clearance and lead angles are ground for turning steel.

These tools are recommended for applications employing tools that have a large cross-section or tools that are bent or offset, or for tool-holders where use of solid toolbits are impractical. In addition to use in turning, boring and facing operations, these tipped tools are suited for various types of forming and grooving operations.

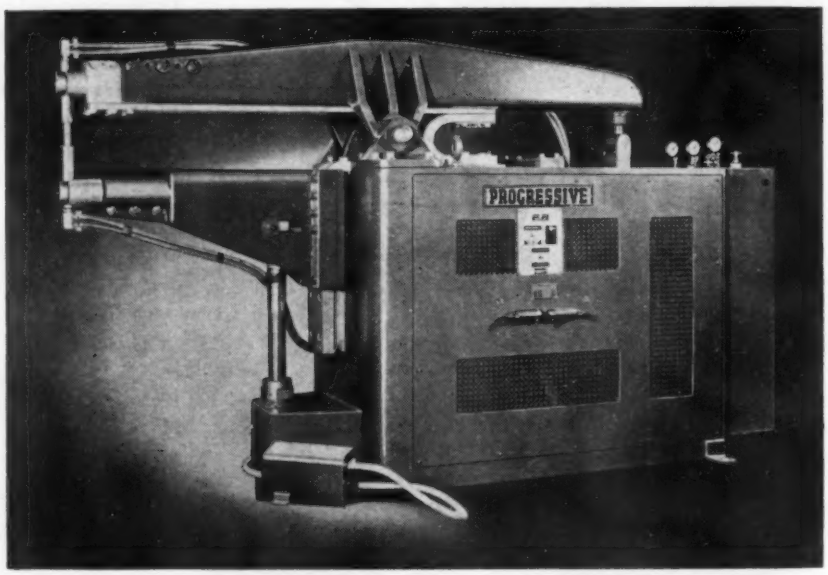
Style P is a right-hand tool while Style Q is a left-hand tool. Both are ground with a 15 deg. end cutting edge angle, a 15 deg. side cutting edge angle, a 7 deg. end and a 7 deg. side relief angle. They are furnished



Stellite-tipped tools

with flat tops so that side rake angle can be ground for each particular job.

The tools are stocked in the following sizes: $\frac{5}{8}\times1$ $\frac{1}{4}\times8$ in., $\frac{3}{4}\times1\frac{1}{2}\times9$ in., $1\times1\times7$ in., $1\times1\frac{1}{4}\times7$ in., and $1\frac{1}{4}\times1\frac{1}{4}\times7$ in. Styles P and Q are also made with Stellite Star J-metal tips.



Progressive rocker arm welder

Progressive Rocker Arm Welder Handles Structural Sections

Progressive Welder Co., 3050 East Outer Drive, Detroit 12, Mich., has available a rocker arm welder capable of handling in continuous production the spot-welding for aircraft and other types of equipment of structural aluminum sections up to $\frac{1}{8}$ in. Alclad. The machine measures 35×66 in. at the base and is 5 ft. high.

Throat depth is adjustable from 36 to 42 in., and throat opening from $7\frac{1}{2}$ to $17\frac{1}{2}$ in. In addition to normal 1 in. working stroke of the rocker arm, it is also provided with a retracting stroke which provides a $4\frac{1}{2}$ in. clearance between points for insertion of flanged work.

Controls are provided for three different pressure conditions. Normal welding pressure is applied by depressing the foot switch. Forging pressure is applied automatically. To apply light pressure a toggle switch is thrown on the machine and the foot switch is depressed as for welding.

Standard electrodes and holders

Even FOR GEARS *High* AS A HOUSE—

There aren't many calls for hobs to machine enormous gears capable of resisting heavy shock loads, but when such gears are needed, Gear Production headquarters produces even such hobs to high precision despite all the machining and heat-treating problems involved in their production.

The hob shown in process of manufacture above has a "one" diametral pitch. The gear teeth it will produce are thus several times the size of even those on main drive gears for battleships—gears which are sometimes two stories high.

This 10¾-inch diameter, 15-inch long high speed steel hob, when finished, weighed around 175 lbs. indicating the care, knowledge and equipment required in heat-treating.

Close production control by Michigan Tool Company's metallurgical laboratory is of major assistance in meeting such tool production problems, as it is of major help in producing all forms of hobs, shaper cutters and other gear cutting tools in large or small sizes or quantities.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

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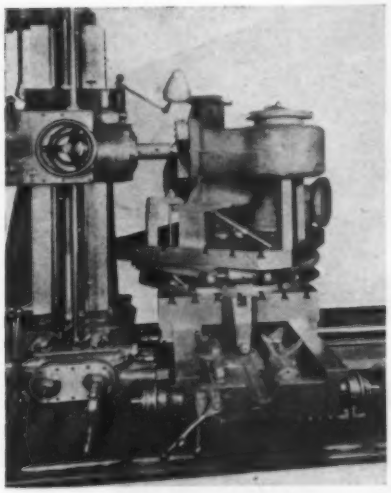
can be handled in the upper and lower arms, although refrigerated welding points may also be used. Electrodes may be mounted either vertically or at a 22½ deg. angle.

Transformers are of the pancake type with 600 turns, while a four-position tap switch enables selection of various turn ratios.



Portage rotary table

Portage Produces Rotary Table For Use With Boring Machine

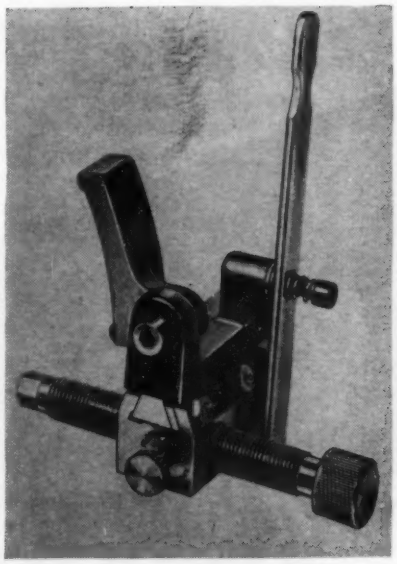
Portage Machine Co., Akron, Ohio, has produced a rotary table to be used in connection with its horizontal boring, drilling and milling machine. Tables in sizes 36×36 in. or 48×48 in. are available.

Fixed bushings at 90, 60, 45 and 30 deg. points are provided. The table pivots on roller bearings and the base has hardened keys to permit easy alignment on the boring mill table.

Frostrode Makes Frostcaps For High Electrode Pressures

A line of Frostpoint refrigerated resistance welding electrodes with replaceable Frostcaps of Mallory-3 metal has been made by Frostrode Products, 19003 John R, Detroit 3, Mich. The Frostcap may be used with any standard or offset Frostpoint electrode and is available in ⅝ or ⅞ in. outside diameter.

This cap is designed for welding operations requiring high electrode pressures. Construction of the electrode is similar to other types of Frostpoints made for normal electrode pressures in which hard drawn copper is used for maximum electrical and thermal conductivity.



Florian Jiffy wheel dresser

Florian Jiffy Wheel Dresser For Use on Surface Grinder

American Standard Co., Southington, Conn., is offering the Florian Jiffy wheel dresser for mounting on surface grinders. It will fit all standard machines.

This dresser forms an integral part of the grinder on which it is mounted, and is ready for wheel dressing regardless of the relative position of the wheel to the table. When using this dresser, the work set-up does not have to be disturbed.

StaSafe Mask and Acid Hood Resistant to Acids, Lacquers

Protection for head and shoulders against spray, splash or shower of acid is provided by the StaSafe mask and hood made by Standard Safety Equipment Co., 232 West Ontario St., Chicago 10, Ill. The material is said to be flameproof and resistant to acids, solvents, lacquers, oils, greases and many other solutions injurious to eyes and skin.

The mask and hood are mounted on a StaSafe headgear, which is adjustable to any size. The transparent acetate-formula shield is replaceable without tools. This equipment is designated as SD-2129.

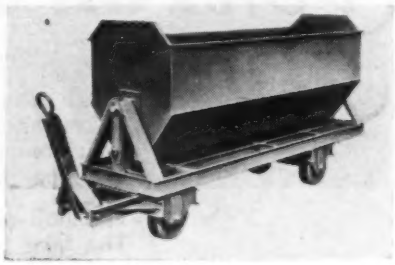
Hammond Makes Chip Breaker And Diamond Finishing Grinder

Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo 54, Mich., has manufactured a heavy-duty chip breaker and diamond finishing grinder. It features an angle vise that handles all types of box and single-point tools up to 2 in. (larger if required). The vise has universal adjustments and dials are the direct-reading type. Weight of this grinder is 750 lb.

Hammond chip breaker grinder

The diamond finishing grinding side is designed for use of either a 6 or 7 in. diameter cup wheel. The tilting table assembly is moved in and out by screw adjustment. A safety cup disk prevents the operator from catching fingers or tools into cup of wheel during operation.

This Model CB-76 grinder is powered by a ½ hp. motor, and has a 1½ gal. coolant tank.



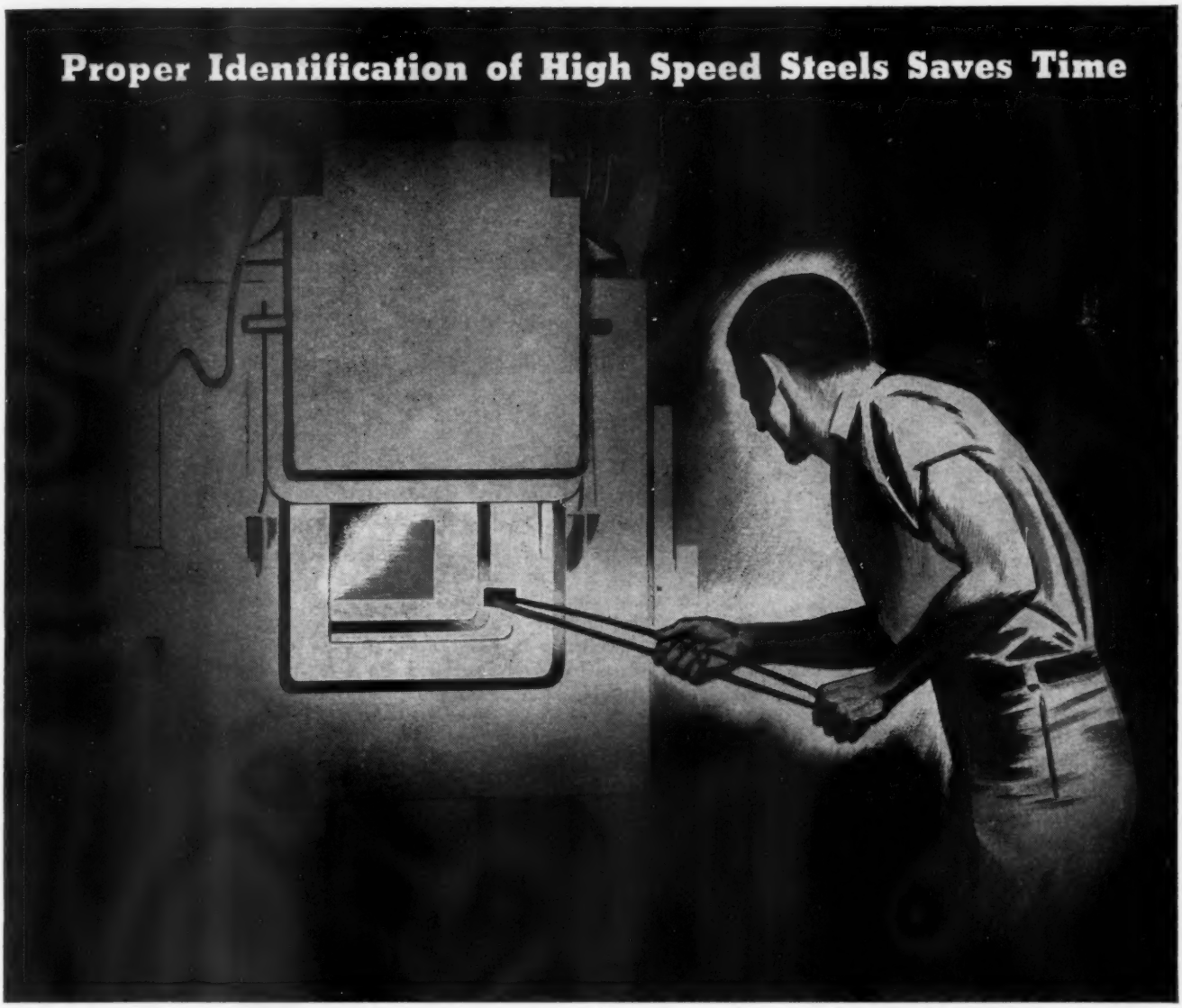
Palmer-Shile trailer truck

Palmer-Shile Trailer Truck Can Be Dumped to Either Side

A side dump trailer truck has been built by Palmer-Shile Co., 780 South Harrington Ave., Detroit 17, Mich. Capacity of this truck is about 2 cu. yd., recommended load rating is 3 tons. Overall measurements are 9 ft. long, 34 in. wide and 56 in. high. It weighs approximately 1,400 lb.

Simple pivot design eliminates

Proper Identification of High Speed Steels Saves Time



Plants using both tungsten and molybdenum types of high speed steels should give serious consideration to the establishment of an efficient identification system—one that will keep the steels separated from bar stock to finished tool.

The danger of spoilage is particularly acute when mixed lots get into the heat treaters' hands.

The recommended hardening temperatures for tungsten types are 100° to 200°F. higher than those for the molybdenum types. Treating the latter so far above recommended temperatures will spoil them for cutting tool service. Treating the tungsten types that far below recommended hardening temperatures will not develop the required red hardness.

Heat treaters sometimes use the "sweating" of tungsten types as an indication that the steel is up to proper hardening temperature. *THIS DOES NOT HOLD WITH MOLYBDENUM TYPES.* In their case, a pyrometer should always be used to determine when the steel is at the recommended hardening temperature.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

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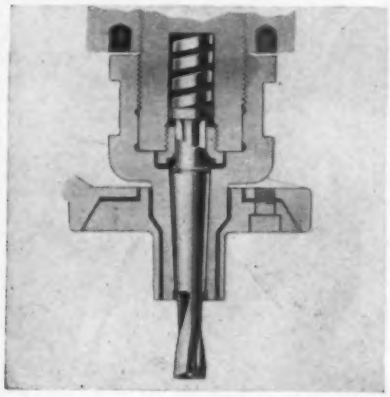
MOLY

need for gears and allows dumping to either right or left side. Locking pin holds the body in upright position for loading and hauling. This truck has four rubber tired, metal wheels, 12 in. in diameter and 4 in. wide. It is equipped with fifth wheel construction.



Onsrud taper friction chuck

Onsrud Inverted Taper Chuck Permits Close Grip of Bit

An inverted taper friction chuck has been developed by Onsrud Machine Works, 3910 Palmer St., Chicago 47, Ill. This chuck permits gripping of router bits immediately adjacent to the cutting edge.

It is said that the use of the taper chuck counteracts the effects of side thrust developed by cutting pressure, resulting in minimum bit breakage. A spring and pin unit is employed to maintain pressure on the end of the router bit. This pressure causes tapered surfaces of the bit and chuck to grip so tightly that bit slippage is claimed to be prevented.

Ru-Pre-Sol Rust Preventive Provided for Metal Parts

Ru-Pre-Sol, a rust and corrosion preventive material for use in connection with water soluble cooling cutting oil, has been produced by Machinery Supplies Co., 501 Madison Ave., New York 22, N. Y. This ingredient is added to clear water and water soluble cutting oil.

The quantity of rust preventive ingredient is 1/8 percent of the whole solution, and the percentage of water soluble cutting oil averages between 1 and 3 percent, depending on the material to be worked upon. The liquid dries up by itself, forming a tight, invisible film which fills finest pores of the metal surface.

Zephyr angle drill

Zephyr Makes Angle Drill With a Die-Cast Body

An angle drill with a die-cast body and large area replaceable oilless bearings instead of bronze casting has been designed by Zephyr Manufacturing Co., 201 Hindry Ave., Inglewood, Calif. Steel snap-on guard provides protection for both operator and gear assembly. Spindle offset is 7/32 in., and spindle thread is 1/4-28.

New Method Uses Knockout Pad To Mark Part Numbers on Steel

An improved method for marking part numbers onto deep drawn steel and other parts makes use of engraved knockout pads. The development is a product of New Method Steel Stamps, Inc., 143 Jos. Campau, Detroit 7, Mich.

The necessary figures and numbers are engraved on the upper surface of the pad, making the one piece a combination of knockout pad and marking die. When in use, the pad is backed by springs. It numbers the bottom portion of the stamping during the drawing process, and then lifts the finished piece out of the die after the male half of the forming die has been withdrawn.

New Method knockout pad

Photo Contact Printers Make Negative and Positive Copies

The No. 1518 AP and 1518 BP contact printers for making negative and positive photo copies has been developed by Photo Record Corp., 112 Liberty St., New York 6, N. Y. The equipment will make negative and positive prints 15×18 in. or smaller. Copies from any type of original—black and white, colored, printed one or two sides, single sheets or books—can be made with these printers.

No. 1518 AP printer is 21½ in. long, 18½ in. deep and 15 in. high. It weighs 45 lb. A synchronous motor automatic timer and full-sized lightproof drawer for storing sensitized paper are provided.

The No. 1518 BP printer has the same dimensions as the other model but weighs only 45 lb.

Bellows Power Feed Unit Converts Press to Tapper

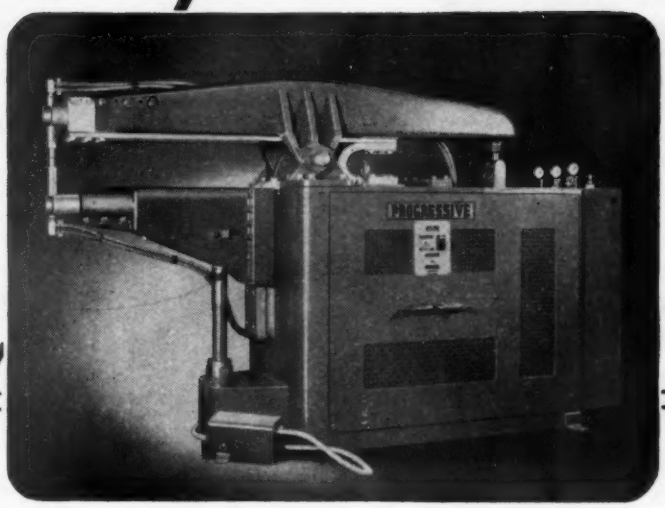
Automatic tapping with precision Class III threads is said to be possible on almost any type of drill press with the Electroaire power feed unit produced by Bellows Co., Akron, Ohio.

The power feed utilizes a solenoid controlled air motor to advance and retract the spindle. Feed and retraction speeds are independently controlled and are subject to infinite variation. Down feed is held under exact pressure at all times. Operation of the feed is controlled by a foot switch. The feed may be synchronized to solenoid controlled jigs, work feeds and fixtures to make the entire operation automatic. Power

Bellows power feed unit

Announcing

A WELDER



for **STRUCTURAL ALUMINUM**

- **Handles ⅛" to ⅜" 24-ST**
- **Maximum welding Pressure 6500 lbs. at 90 air-line**

Companion model to the highly successful Progressive Model "B" the new model "C" for welding structural aluminum and alloy sections by stored energy embodies all the features which have contributed so much to the outstanding performance of the lighter model in welding Alclad between 0.016 to 0.081 ST.

These include the throwing of all rocker arm deflections into the vertical plane to provide a "spring follow up" during the weld, improving weld quality; a triple pressure system providing normal welding pressure, maximum welding pressure (after capacitor discharge) and a light pressure for point dressing. Outstanding too, is the rigidity of the machine.

For Complete Information Write for **BULLETIN No. 103 (BULLETIN No. 102 ON THE MODEL "B" FOR LIGHTER GAUGES)**

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

feed may be set for multi-cycle operation with indexing fixtures and dial feeds.

This Electroaire unit makes possible high-speed automatic drilling with wire size drills. Stroke is adjustable up to a maximum of 1¼ in.

Kano Kroil Chemical for Metal Used to Loosen Frozen Parts

For loosening frozen metal parts, Kano Laboratories, 75 East Wacker Drive, Chicago 1, Ill., has produced Kano Kroil. This chemical combination creeps into spaces as small as a millionth of an inch according to the manufacturer. It is claimed that parts can be loosened quickly without harm to metal.

Spencer Sump-Vac Equipment Removes Liquid from Sump Tank

The Sump-Vac has been produced by Spencer Turbine Co., Hartford 6, Conn. A vacuum producer is mounted on a closed tank on wheels and provides for removing liquid and sludge from sump tanks. It is claimed that the rate of pick-up of liquid is 40 gal. per min.

Tank capacity is 125 gal. The Sump-Vac is available in sizes ¾ to 1½ hp., universal or single phase motors, 25 to 60 cycle, 110 or 220 v.

A filter basket collects chips and heavy sludge. Overfilling the machine is prevented by a ball float valve. The machine is emptied by gravity in a couple of minutes, or by turning the valves and connecting the hose to the drain valve liquid can be discharged under approximately 3 lb. pressure. No priming is required, and material in the sump tank is cleaned out by air vacuum after the liquid is removed.

This equipment may also be used for cleaning closed tanks, pontoons or for handling any liquids.

Spencer Sump-Vac

Televiso Tube Voltmeter For RF-AF Applications

A vacuum tube voltmeter for RF-AF applications is offered by Televiso Products, Inc., 6533 North Olmsted, Chicago 31, Ill. Features of the instrument include high sensitivity, stabilized zero and built-in standard cell for calibration checks. Voltage ranges are 0.5-5-50-200 a.c. full scale,

Televiso voltmeter

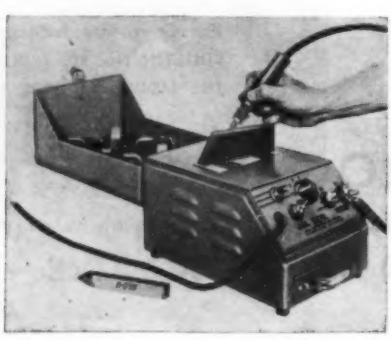
and frequency ranges from 2 c.p.s. to 150 megacycles.

This voltmeter has automatic zero adjustment on all ranges. Readings vary 1 percent with 10 percent line voltage fluctuation.

Ideal Combination Tool Etches or Demagnetizes

A combination etcher and demagnetizer has been produced by Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill. Small parts to be etched are placed on the work plate and the switch turned on to the proper heat. For etching parts too large for the work plate, a ground clamp is provided. Measurements of the plate are 8¾×7¾ in. Overall dimensions of the tool are 8¼×11½×8⅝ in. It weighs 39 lb. Fourteen heats—Lo 90, 150, 200, 250, 350, 450, 600; Hi 300, 400, 500, 650, 850, 1,100 and 1,350 watts are provided by the Hi-Low tap and seven-point switch.

To demagnetize, it is only necessary to turn the switch on to either No. 1 or No. 2 position and proceed as with an ordinary demagnetizer. Maximum rating is 5.5 amp. Overall pole area is 13½ sq. in.

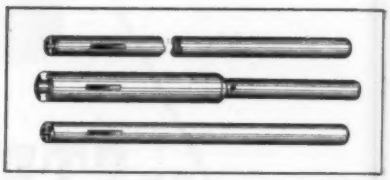


Ideal etcher and demagnetizer

Topflight Broken Drill Tool Has Self-Locking Feature

A broken drill adapter has been built by Topflight Tool Co., Towson 4, Md. It has one-piece construction and eliminates soldering and setscrews. This adapter is made in sizes to fit all drills.

The broken drill is inserted in the adapter and is self-locked. Vibration is said to increase the grip of the locking device, yet the broken piece can be easily ejected when desired. Aircraft plants have found this tool useful for extension drilling.



Topflight broken drill adapter

Industrial Work Handler Designed in Open Back Style

A two-finger open back work handler has been designed by Industrial Gloves Co., Danville, Ill. The hand pad is made of chrome tanned cowhide split leather. It has a double thickness wearing surface across the palm and over the side and back of the forefinger. All seams are sewed with steel thread. An adjustable fastener is provided at the wrist.

Vard Precision Ring Gage Come in Several Thread Forms

A precision ring gage has been produced by Vard, Inc., 2961 East Colorado Blvd., Pasadena 8, Calif. This gage is made from tool steel, heat-treated to a Rockwell hardness of 63 to 66. Size No. 10 and larger have

Carried in Stock

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For T.C.T. Standard Diamond ground single point tools, carried in stock, ask for Bulletin No. 44-1A.

For T.C.T. Carbide Blanks carried in stock, ask for Bulletin No. 44-2A.

Hardened Shanks Boost Carbide Reamer Life

T.C.T. carbide reamers—CARRIED IN STOCK in standard sizes—are not just carbide *tipped*. They are designed and produced to take full advantage of the faster cutting and higher hole accuracy made possible by cemented carbides.

Every T.C.T. stock or special carbide tipped reamer has the shank back of the tips hardened to provide greater strength and reduced flute wear. As a result, the carbide tips have an even longer precision cutting life. Furthermore, all tips are diamond ground—while the O.D. is held to plus 0.0003 in., minus zero.

Available from stock in both straight and taper shank styles. Generous tip width enables securing of many special reamer sizes by simple re-grinding of the O.D. (either at T.C.T. at slight added cost, or in your own shop).

For sizes carried in stock and prices, write or wire for Stock Tool Bulletin No. 43-1.

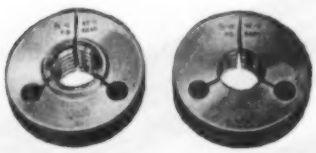
TUNGSTEN CARBIDE TOOL *Company*

2661 Joy Road, Detroit 6, Michigan

TCT

the first thread completely removed to prevent chipping. This is said to increase ease of use and add to life of the gage.

These gages are made in sizes from No. 6 up to 12 in. diameter. They



Vard precision ring gage

are ground in National Fine, National Coarse, National Extra Fine, Metric, Whitworth and in other standard thread forms, and are adjustable. Special pitches and thread forms in either right or left hand threads can be furnished.

After long service the gage may be returned to the Vard plant for inspection and reset to the master gage. If worn, the gage will be reconditioned.

Acromark Marking Machine For Abbreviated Markings

A bench marking machine is offered by Acromark Co., 9-13 Morrell St., Elizabeth 4, N. J. The equipment marks ferrules, fittings, caps, adaptors,

Acromark bench marking machine

thin walled tubular sections and other parts requiring an abbreviated designation.

This marking machine features an easily accessible open face loading arrangement with an automatic ejector. As many as 12 parts may be marked with a single stroke of the operating lever. Letters or figures can be interchanged in the die-holder or solid dies may be substituted where marking changes are few and smaller storage of spare parts is desired. Adjustments in marking depth can be made for different materials and thicknesses.

Elox Tap Disintegrator for Removing Broken Taps and Drills

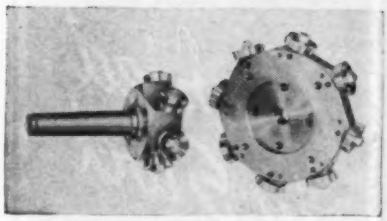
Elox Corp., 3252 General Motors Bldg., Detroit 2, Mich., has developed a tap disintegrator which is operated electrically to burn away the cores of broken taps, drills studs and other threaded tools and parts which remain in work. The unit is used by inserting the disintegrating head in a drill press spindle nose and directing it into the work.

A separate cabinet contains a transformer and the water supply used with the disintegrator. Actual burning away of the metal is done through the use of hollow electrodes which are forced into the work through an oscillating motion in the head. Water

Elox tap disintegrator

which runs through the electrode helps to cool it, speeds disintegration and washes chips from the hole. Electrodes now available range in size from 0.040 in. to ¾ in.

This method of removing broken tools is said to leave threads in work unharmed. It operates on either 110 or 220 volt current.

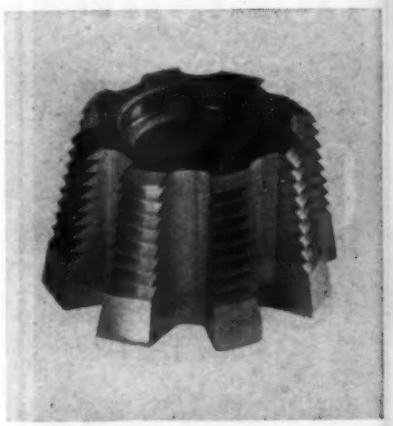


Shearcut milling cutter

Shearcut Milling Cutter Offered in Two Shank Styles

Shearcut Tool Co., 362 South Maple Drive, Beverly Hills, Calif., is offering a milling cutter with No. 40 National standard shank or No. 9 B. & S. taper shank.

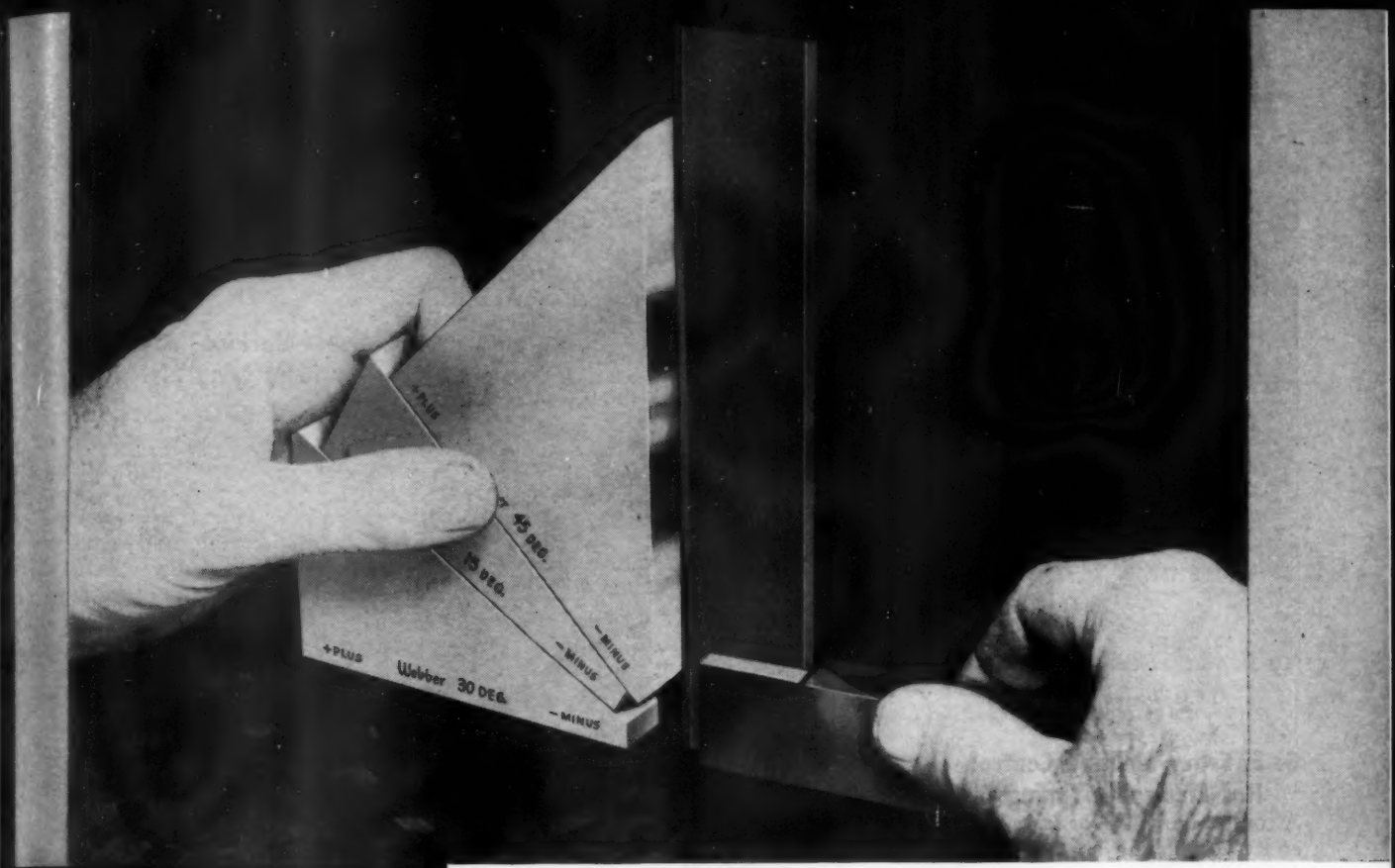
When a cutting edge of a Shearcutter is dulled, rotation of the cutter a fraction of an inch provides a new cutting edge. It is said that in removing a curled chip like a lathe tool this milling cutter usually leaves a finish without tool marks, which often eliminates the necessity for grinding or polishing. The tool may be rotated in either direction.



Detroit taper thread milling cutter

Detroit Taper Milling Cutter Speeds Straight-Sided Milling

A taper type thread milling cutter has been produced by Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 11, Mich. This cutter permits the production of straight-sided threads at production speeds. Cutter teeth engage the work parallel to the axis of the threads being formed but rotate in a plane inclined to the straight side of the thread. Inclination of the cutter at an angle equal to the taper of the cutter provides clearance for the straight side cutting face. A plain milling section of the cutter removes the incomplete thread at the outer edge.



New
Webber
Angle Gage Blocks

Only 3 Webber Angle Gages—and you have a perfect square

● Webber Angle Gage Blocks give to industry one of the easiest—quickest—most accurate methods of checking angles yet devised.

In a set of only 14 Angle Gage Blocks you have available any number of angles up to 370,800 in steps of 1 second of an arc. No mathematical computation is required. A table furnished with each set shows which blocks to use and how to combine them to get any desired angle.

For example—in the illustration above, it took only three angle blocks to make a right angle. A 45 degree block, a 30 degree block and a 15 degree block were wrung together with the minus side to the right to obtain the desired angle—simply—easily—quickly.

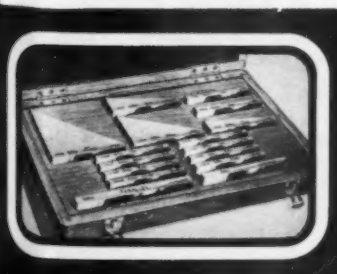
Webber Angle Gage Blocks are adaptable to a host of applications from setting up work in a machine to final inspection. They will help you reduce set up time and eliminate frequent errors.

They are furnished in sets of 14 blocks —3 series

1st series 1—3—9—15—30—45 degrees
2nd series 1—3—9—27 minutes
3rd series 1—3—9—27 seconds
Price—Set Angle Gage Blocks—$450.00

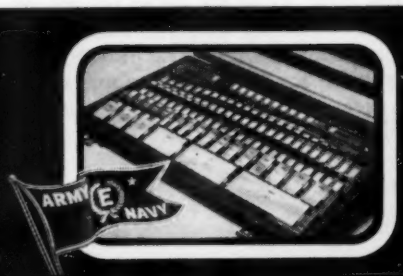
Let Webber Angle Gage Blocks help you improve the accuracy of your work — increase production —reduce costs.

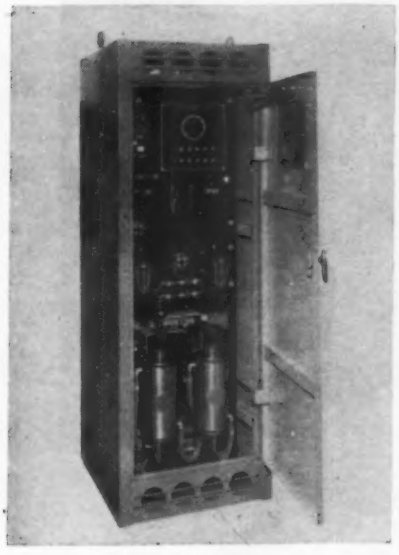
Fully descriptive bulletin upon request.



Webber GAGE COMPANY

12901 TRISKETT RD. • CLEVELAND 11, OHIO





G.E. seam welding control

G. E. Seam Welding Control Has Electronic Timing Circuit

A control designed for seam welding, and incorporating an electronic timing circuit, has been announced by General Electric Co., Schenectady, N. Y. This resistance welding control is designated as Type CR7503-B110 and is suited for operations where frequent changes of the timing pattern are required. It operates on 230, 460 or 575 volt, single phase, 60 cycle power supply.

This unit consists of a timing panel, a firing and a heat control panel, and a power panel. Any one of these panels can be separately disconnected and removed to facilitate servicing. Accuracy of the timing pattern is provided by the electronic circuit without utilizing moving parts.

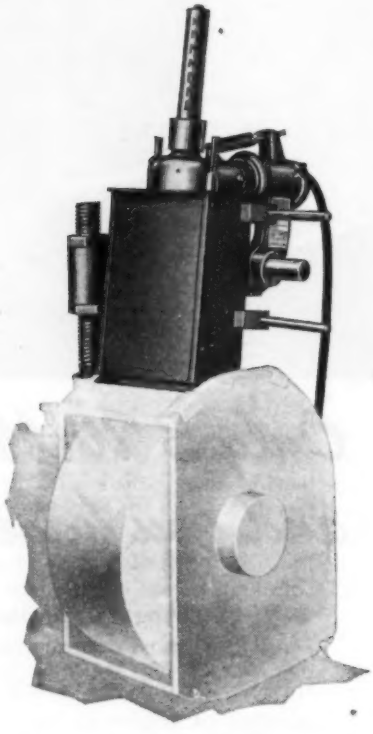
The control is mounted in a floor type inclosure, the full-length front and rear doors of which can be locked. A calibrated heat control dial is located on a panel and is accessible through a flap opening in the front door. Snap switches, for heat and cool time adjustment in one cycle steps from 1 to 30 cycles, are also located in this panel. A row of indicating lights on the door show whether the water flow is adequate, power has been supplied and whether the time delay has timed out.

Pipe Machinery Offers Gages Equipped With Pilot Feature

PM pilot gages are being offered by Pipe Machinery Co., 930 East 70 St., Cleveland 8, Ohio. The pilot feature is said to make gage applications easier and quicker in tight or in blind holes.

The operator inserts one side of the gage, holding it at a slant, then straightens the gage up to perpendicular. It centers itself and moves into the hole.

This pilot protects the gage from rapid wear at the nose end. Any standard or special cylindrical plug gage can be supplied with this pilot feature—taper or tri-lock gages, regular, progressive or extra length gaging members.



Hammond Auto-Doper applicator

Hammond Auto-Doper Applicator Suits Round or Oblong Bars

An automatic air-operated cylindrical and rectangular applicator called the Auto-Doper is offered by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich. It can be used on any type of polishing and buffing machine, and, by merely changing the composition housing, either cylindrical or rectangular bars can be accommodated. The rectangular Auto-Doper is suited for composition bars 2×2 in. and up to 2×12 in. wide and 10 in. long, for applying composition to wheels from 2 to 12 in. in width. The cylindrical unit handles composition bars up to 2¾ in. diameter and 10 in. long. The composition bar is partially rotated at each stroke, which permits using up full diameter of the bar regardless of the width of wheel.

Operation of the Auto-Doper is by compressed air, and frequency of performance is controlled by an air valve operated from a cam, electrical timer or foot valve.

Noblewest Marking Machine For Identifying Piston Rings

For marking a trade mark, part number or other identification into piston rings, Noble & Westbrook Manufacturing Co., East Hartford 8, Conn., is offering the No. 183 Noblewest marking machine. It can be used, when retooled, for marking inscriptions into other flat parts of uniform thickness. The mark on piston rings is confined to a space approximately ½ in. in length.

Motor is housed in the base on an adjustable bracket which is adjustable to take up belt tension on either a flat or V-belt drive.

The main work carrying dial is mounted on a vertical shaft driven by a built-in worm drive. This dial has six loading stations. The marking die mounted at the back of the machine is on a spindle which is geared to the dial. Adjustments are provided so that the mark can be moved forward or backward at each station as well as in or out from center of dial. Adjustable V gages are provided so that all sizes of rings up to 6 in. in diameter can be marked in the same machine.

Noblewest piston ring marking machine

FLAME THROWERS OF THE STEEL FRONT

Bessemer converters are the flame throwers of production on the steel front. They spear the skies over the busy steel plants of America with fiery warnings to our enemies.

The Bessemer process first made steel available in commercial quantities. In recent years progress in the operation of converters has been outstanding, with "flame control" —a product of J&L research — the first major scientific contribution to uniformity of quality.

Easy to work and machine, this new steel now supplying urgent war needs, promises abundant contribution to better living in peace time.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

THE BESSEMERS

"Blow air through molten iron and expect to improve its quality? or make steel? Ridiculous idea!" exclaimed British iron workers back in the 50's when an Englishman first proposed it. "A crazy notion! It will just cool the iron!" scoffed iron workers in this country when an American began toying with the same idea at about the same time. But the inventors persisted with their experiments in oxidation of molten metal and secured such results that the world experienced an industrial evolution which gave it the superior metal, steel, in commercial quantities, at prices that enabled its wide application in commerce, construction and transportation. (In the 50's steel was made in small lots, sold for $250 to $300 a ton).

42-year-old Henry Bessemer, prolific British inventor, not then a steel man, conceived the converter for transforming iron into steel by blowing air through the molten metal, and patented it in 1855. (He formed own steel company in 1858). Bessemer was knighted at 66, not for inventing steel converter, but for suggestion he made when only 20 years old for an improvement preventing re-use and counterfeiting of seals and stamps on official documents.

"Kelly's air boiling process" was the name William Kelly, an ironmaster of Eddyville, Ky. and a native of Pittsburgh, gave to his experiments in a crude little brick furnace pot in which, a few years before Bessemer's invention, he explored his "crazy notion." Kelly's converter, by his own admission, never "converted," i.e. changed iron into steel, but did yield a more highly refined iron.

Bessemers are spectacular, especially at night, as their pulsating flames and sparks fan high in the heavens, constantly changing colors from ruddy red through burnt orange and pale yellow to blinding white. Converters situated on banks of rivers or lakes put on a show that is doubly thrilling by reflection of the fiery scene upon the black night waters. Travelers to Pittsburgh often watch the stirring technicolor picture of the Bessemers at work for Victory in the big J&L Pittsburgh Works along the Monongahela River, and gaze fascinated at the fiery scene when passing the great 4-mile long J&L Aliquippa Works on the Ohio River.

25 tons of steel every 15 minutes are made in the big pear-shaped Bessemer vessels. Demands for war steel keep the Bessemers of America working night and day, seven days a week, month in, month out.

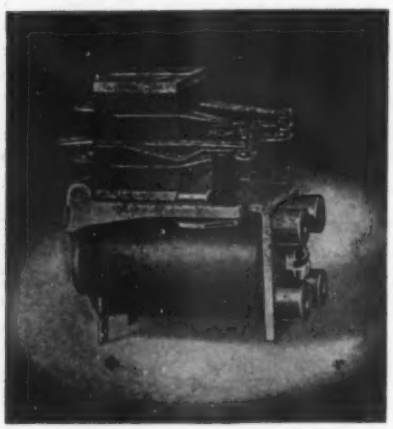
The unwinking eye of the Bessemer flame control device, an invention of Jones & Laughlin (patented in 1940), is the first basic improvement made in the process since Sir Henry's day. It is an arrangement of photo-electric cells, filters and relays which indicates the precise moment the analysis of the steel is right.

Parts and Materials

Allied Telephone Type Relay Made for High Frequency Use

Allied Control Co., 2 East End Ave., New York 21, N. Y., has produced the Model TKL telephone type relay for high frequency use. It has been designed for maximum magnetic efficiency with resultant sensitive operation at minimum power input. Mycalex insulation has been incorporated, but the relay can be supplied with approved Bakelite insultion for standard switch service.

The coil is sealed with cellulose acetate for resistance to humidity. This relay is claimed to meet standard salt spray specifications, and will withstand shock and vibration to 10 G. Contacts are of palladium but fine silver or special alloy contacts are available. Double pile-ups of contacts can be furnished from single



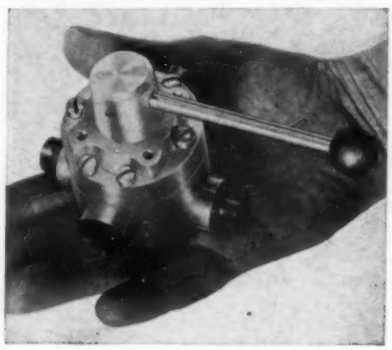
Allied telephone type relay

A, B or C arrangements to a maximum of four C combinations. Weight and dimensions, less contact pile-ups, are 1.5 oz. and 1 7/16×1 5/16×1 1/16 in. high. Tapped studs are brazed to the frame for mounting and prevent short circuits.

Hydraulics Control Valve Operates at High Pressure

A hydraulic directional control valve has been designed to operate under pressure of 3,000 lb. per sq. in. with maximum handle torque of 20 in. lb. The unit is made by Hydraulics, Inc., 457 South Fair Oaks Ave., Pasadena, Calif. Weight of this semi-balanced poppet type valve is 13 oz. It is available in 3 to 5 gal. per min. and 6 to 10 gal. per min. sizes.

Excessive pressure in the cylinder lines caused by thermal expansion of the fluid is said not to affect operation and handle torque. Likewise, back pressure, caused by the valve



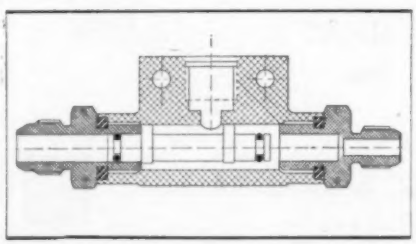
Hydraulics control valve

being partially open, does not add to the handle torque.

A rotary disk type cam permits operation by a small electric motor. The electrically driven unit is available for 24 volt, 3 amp. d.c. circuits and 200 volt, 400 cycle, a.c. circuits. Mounting and porting, either A.N. or A.C., can be provided to specifications desired.

Electrol Shuttle Valve Offers Pressure Failure Alternate

A shuttle valve, for use in aircraft hydraulic systems to enable the substitution of compressed air for oil



Electrol shuttle valve

in case of hydraulic pressure failure, has been produced by Electrol, Inc., Kingston, N. Y. This valve is made of aluminum except for the four toroid seals, and contains no springs and only one moving part.

This valve comprises a body, two ends and a shuttle. There are three ports. In normal operations oil flows through one end and out the center port. In emergency or when additional pressure is required, compressed air is released through the opposite end and out the center port. At the same time the oil entrance port is closed.

Cherry Blind Rivets Supplied With Notch in Pulling Mandrel

Blind rivets made by Cherry Rivet Co., 239 Winston St., Los Angeles 13, Calif., are now being supplied with a notch in the pulling mandrel of the self-plugging type rivet. This notch serves to check the flow of metal in the upsetting process employed in forming the pulling head.

Another advantage is that a shorter mandrel is required, thus effecting a saving in material as well as providing for a shorter drawbolt movement.

St. Regis Makes Panoform Laminated Plastic Sheets

Panoform laminated molding material, consisting of layers of fabric or paper impregnated with a specially formulated phenolic resin, is available from St. Regis Paper Co., Panelyte Div., 230 Park Ave., New York, N. Y. This material is furnished in sheets up to 48×60 in. and from 1/16 to 1/8 in. thick. Black and natural are the only colors available at present.

Sheets are formed over inexpensive wood or metal molds or dies and are especially suited for small runs. Sharp angle bends and compound curvatures can be made. Pressure ranges up to about 250 lb. per sq. in. For forming, the Panoform sheet rather than the mold, is heated in an oven under infra-red lamps or by dipping in hot oil.

World's Oddest Oilcan!

An adaptation of a hypodermic needle is used to meter an *exact amount* of oil into tiny New Departure ball bearings.

This is only one of the many painstaking steps in the manufacture of perfect instrument bearings. *Why such care?*

Because ball bearings, small and large, carry a heavy wartime responsibility. Everywhere you look you'll find them doing absolutely vital work. Indeed . . . one reason for the success of Allied aircraft and other war equipment is the long life and accuracy of the ball bearings used. It is New Departure's privilege to play the lead in wartime production of ball bearings. It has an ability *to get things done*, even under the most difficult conditions. These qualities will prove increasingly helpful to all manufacturers who have ball bearing problems.

Nothing Rolls Like a Ball

NEW DEPARTURE

BALL BEARINGS

3249

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

Sales Branches: DETROIT, G. M. Bldg., *Trinity 2-4700* • CHICAGO, 230 N. Michigan Ave., *State 5454* • LOS ANGELES, 5035 Gifford Ave., *Kimball 7161*

SHELL END MILLS

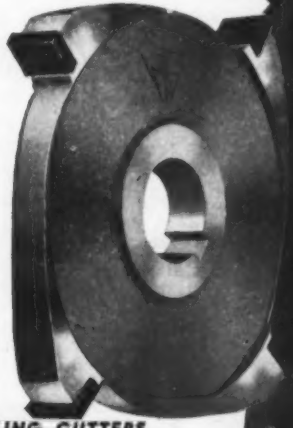
Tool No. SEM for cast iron and non-ferrous materials. Tool No. SSM for cutting steel. Sizes: 1¼" to 6". 4 to 10 teeth. Use up to 20" table feed per minute.

Again

WENDT SONIS

STANDARDIZES

another group of carbide tipped tools



MILLING CUTTERS

Five tool styles for milling steel and non-ferrous materials. Diameters: 3" to 8". 4 to 10 teeth.

They're here! They're New! They're Standard! These Wendt-Sonis cutting tools are especially designed carbide tipped cutting tools—not adaptations of high speed steel designs.

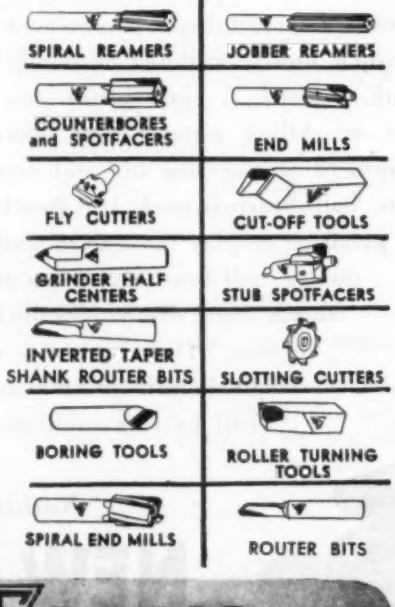
DISTINCTIVE CHARACTERISTICS—

1. **New flute angles**
2. **New fillet designs**
3. **New shank designs**

—plus 25% longer carbide tips on all round tools. All these new tools—many of which were formerly classed as "special" are now standard and listed in new W-S Catalog No. 144. Order through your nearest Wendt-Sonis distributor . . . or write to WENDT-SONIS COMPANY, Hannibal, Missouri or BRANCH WAREHOUSE, Long Beach, Calif.

NEW!

W-S Catalog No. 144 just off the press. Contains all new standardized tools and latest prices. WRITE TODAY for your FREE copy.



WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

TRADE PUBLICATIONS

BELLOWS Highlights of the principles, construction and engineering advantages of "Spring-life" bellows, photographs, diagrams, application chart, selection information, and Cook products employing these bellows, are included in a new catalog issued by the Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.

BENDING PRESSES Catalog 2010-A, offered by The Cleveland Crane & Engineering Co., Wickliffe, Ohio, contains data on the characteristics, operation and performance of Cleveland bending presses and bulldozers.

BROACHING A circular covering all types of broach pull and push heads and containing other valuable broaching information is offered by the American Broach & Machine Co., Ann Arbor, Mich.

COMPRESSORS The Sullivan Machinery Co., Michigan City, Ind., offers Bulletin A-52, a 56-page two-color book describing its line of heavy-duty two stage air-cooled compressors. Fully illustrated, it shows typical installations, gives complete data on available sizes, types and drives, construction detail, foundation requirements, regulation, accessories and servicing.

COMPRESSORS Worthington Pump and Machinery Corp., Harrison, N. J., has announced Bulletin L-690-B1 on LTC angle two-cycle gas engine compressors, Bulletin L-667-B1 on feather valve compressors and Bulletin H-620-B21C on tank mounted feather valve air compressors. Fully illustrated, these bulletins contain descriptions of features, operation and application of these compressors.

COPPER PLATING United Chromium, Inc., 51 East 42 St., New York 17, N. Y., has available a six-page booklet describing the Unichrome alkaline copper plating process. A plating speed table, showing time required to obtain various thicknesses, as well as the wide range of current densities at which the process can be operated, are also included.

COUPLINGS Bulletin No. 446 on manger couplings has been announced by the Farrel-Birmingham Co., Inc., Ansonia, Conn., and Buffalo, N. Y. The bulletin includes engineering details, application diagrams and tables of sizes, ratings and dimensions.

CUTTING TOOLS Wendt-Sonis Co., Hannibal, Missouri, is offering Catalog No. 144—a 48-page book on carbide-tipped cutting tools including spiral reamers, stub taper spot facers and counterbores, straight shank end mills,

staggered tooth slotting cutters, boring tools, roller turning tools and cut-off tools. Requests must be made on company letterhead.

DIE CASTING Up-to-date technical data on die castings of zinc alloy is offered in a revised 64-page booklet "Zamak Alloys for Zinc Alloy Die Castings," announced by the New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

DRILLING The Hoefer Mfg. Co., Freeport, Ill., has incorporated in their new bulletin "Passport to Progress" pertinent facts along drilling and allied lines attractively illustrating and describing their line of equipment.

FITTINGS An attractive wall chart, approximately 2 by 3 ft., covering a complete line of Parker AN fittings for Air Corps and Naval Air Factory designs, is offered by The Parker Appliance Co., Cleveland, Ohio.

GRINDING The Covel Mfg. Co., Benton Harbor, Mich., has published a new handbook on universal cutter and tool grinding entitled "Operator's Instruction Manual," especially prepared to aid the operator, and particularly the apprentice, in tool room grinding. Price, $1.00.

GRINDING WHEELS The Waltham Grinding Wheel Co., 10 Emery St., Waltham, Mass., has compiled a listing of complete specifications of all wheels and mounting plates used on well-known machines. Ask for Bulletin 12.

HAND TOOLS "Facts and Figures" is the title of a 16-page booklet illustrating the advantages of high-speed electric hand tools and giving specific information on the Precise "35" Unit of the Precise Products Co., Racine, Wis.

HYDRAULIC PRESSES The performance of H-P-M "Closed Circuit" Fastraverse presses in production applications for sheet metal forming, drawing, forging, die casting, powder metallurgy and other operations requiring controlled high pressures is explained and illustrated in Bulletin 4400 offered by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

INDUSTRIAL VACUUM CLEANERS Bulletin No. 130, describing the Spencer Sump-Vac, a new portable vacuum producer which cleans machine sump tanks in 2 to 10 min., has been released by The Spencer Turbine Co., Hartford 6, Conn. It also briefly covers the applications of their industrial vacuum cleaners and turbo-compressors.

INSTRUMENTS Concise information on the use and operating principles of control instruments is set forth in Bulletin 98159 on the Fulscope pneumatic set controller of the Taylor Instrument Co., Rochester 1, N. Y.

Capewell Band Saw Blades
Stand Up Longer

Says Manufacturer of Surgical Equipment for War

This manufacturer, cutting both cold rolled and stainless steel, produces surgical cabinets, operating tables and naval galley equipment. On this type of work sawing operations are watched closely — and it was found that Capewell metal cutting band saw blades stand up longer . . . Try them on your tough job.

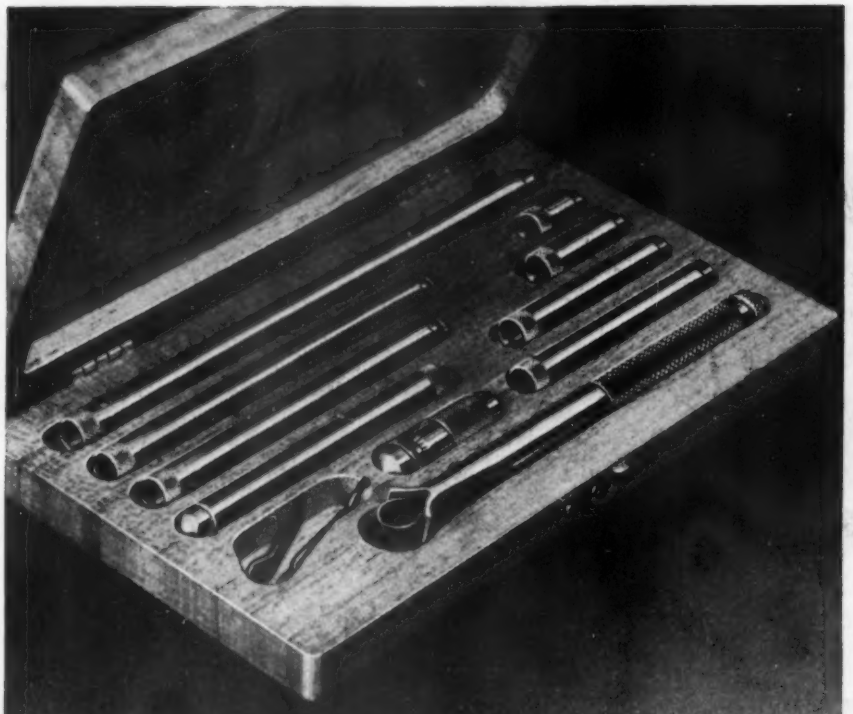
The trend is to Capewell's TECHNITE — the molybdenum high speed hack saw blade

The Capewell Mfg. Co.
Hartford, 2, Conn.

CAPEWELL

Saw Blades

HACK SAW BLADES • CONTOUR SAW BLADES
METAL CUTTING BAND SAW BLADES
WOOD CUTTING BAND SAW BLADES



LUFKIN

INSIDE MICROMETER CALIPERS

FOR BETTER "BALANCE AND FEEL"

For taking exact inside measurements Lufkin Inside Micrometers out-perform all others. Available in sets for taking accurate measurements from 1½" to 40".

Being of hollow steel tubing the measuring rods are light in weight, yet very rigid. The rods can be added to either or both ends of the micrometer head. The head can be kept in the center for better feel, easier adjustment and best reading position.

Rods are adjustable by means of a hardened and ground plug at one end to allow for wear.

For complete facts about these or any other Lufkin precision tools see your distributor. Write for catalog.

LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY

TAPES · RULES · PRECISION TOOLS

MANAGEMENT A 76-page "Blue Book for Management, Shop and Production Engineers," issued by The Delta Mfg. Co., 620 East Vienna Ave., Milwaukee 1, Wis., presents case histories of 140 special-purpose machines, employing Delta equipment, built to expedite war production. The examples illustrated and described cover a variety of operations on metals, plastics and wood.

MARKING MACHINES The Noble & Westbrook Mfg. Co., East Hartford, Conn., has released Noblewest Catalog Supplement No. 43 which covers the latest innovations and improvements in their line of precison marking machines.

MOLDS Interesting facts on the importance of the steel mold for plastic and die cast metals are discussed in a brochure "Shaping Tomorrow Today" available from the Midland Die & Engraving Co., 1800 Berenice Ave., Chicago, Ill.

POWER CENTERS For quick installation in war plants, shipyards and similar applications, power centers—compact, coordinated units substations available in all standard ratings—are discussed in a new booklet announced by Westinghouse Elec. & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa.

POWER TRUCKS "Lady, Will You Give a Lift" is the title of a manual prepared by The Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 14, Ohio, for the training of women in the operation and care of industrial power trucks.

PUMPS Bulletin W-413-B30 on Type VST variable stroke triplex power pumps, and Bulletin W-321-B16 on vertical coolant and circulating Monobloc centrifugal pumps, have been released by Worthington Pump and Machinery Corp., Harrison, N. J.

SCREW PRODUCTS The complete line of standard screw machine products manufactured by Aluminum Company of America, Pittsburgh, Pa., are described in a 60-page booklet. It has separate sections on machine screws, bolts, nuts, washers and rivets, screw thread data, capacity and facilities for special parts, and an appendix including tables of mechanical properties of wrought aluminum alloys, strengths of driven rivets, and government specifications.

SPOT WELDERS Manual and automatic spot welders made by Pier Equipment Mfg. Co., Benton Harbor, Mich., are illustrated and described in Catalog 42 offered by that company. Details of important parts, regulator controls and automatic weld timer for controlling the timing periods are given. Welding capacity charts for all welder sizes and for different throat depths are included.

STEEL Bulletin 643 of the Jessop Steel Co., Washington, Pa., describes the essential characteristics and uses of Jessop "J" and "JJ" hot work die steels.

SWITCHES Catalog and Handbook No. 441, presenting a line of manually operated foot switches, is available from the General Control Co., 1200 Soldiers Field Road, Boston 34, Mass. It illustrates three basic models, gives details on applications, dimensions, construction, and contact arrangements, and briefly covers other products made by this company.

TOOL AND DIE STEELS A handbook of engineering data, welding procedures and heat treatment procedures for tool and die steels has been issued by C. E. Phillips & Co., 2750 Poplar St., Detroit 8, Mich.

TOOL STEEL "Tool Steel for the Non-Metallurgist," explaining the characteristics of various tool steels, the purposes for which each is adapted, and suggestions for heat treatment, is offered by the Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., for use in apprentice training classes.

WELDING ACCESSORIES Victor Equipment Co., 844-54 Folsom St., San Francisco, Cal., announces "Victor Welding and Cutting Apparatus Unit Bulletin, Form 20" which illustrates and describes various items of their welding and cutting equipment. Prices and ordering instructions are included.

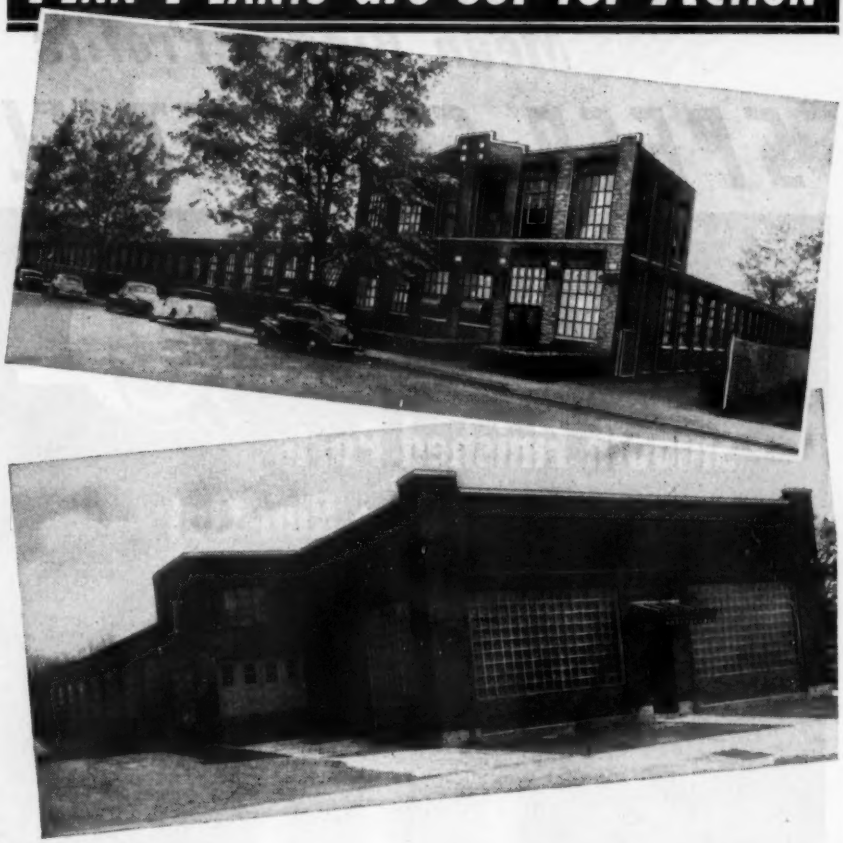
WELDING CONTROL General Electric Co., Schenectady, N. Y., announces Bulletin CR7503-D160 on their current-regulating compensator for G-E thyratron-welding control. Illustrated, the booklet discusses current variations, their effect and elimination and the applications, description and operation of this control.

NEW BOOKS

STEEL IN ACTION—*By Charles M. Parker, technical secretary, American Iron & Steel Institute. 221 pages. Published by the Jaques Cattell Press, Lancaster, Pa.* $2.50.

This book, about steel, tells what it is, and how it is made, and what part it has played in building America into the greatest industrial nation in the world. Written in simple flowing style, it will appeal to the layman with no knowledge of steel making, and yet its technical accuracy makes it an excellent reference for engineers and metallurgists. It includes an outline history of iron and steel from their discovery to their introduction into North America. There is a chapter on the manufacture of iron and steel

FENN PLANTS are set for ACTION



Building War Products Today
Peace Time Products Tomorrow

FENN Plants have had years of experience in the design and building of special machinery. That is why they were able to turn quickly to war production and turn out the precision parts and assemblies needed by the builders of such famous fighter planes as the Navy's Corsair; why they have been able to work with war plants in practically every industrial center supplying them with vital parts and assemblies needed to complete machines, guns, and equipment.

Fenn for Special Machinery

FENN designers and engineers are accustomed to working at close tolerances in the machining of precision fitted parts. They have the plants and facilities to handle almost any production job calling for exceptional training and experience. Consultation is invited and involves no obligation. Are your plans in the blueprint stage? If you plan to build a machine or assembly and want an organization with skill and long experience to build it, get in touch with FENN.

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Mean Bigger Profits

SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

ELIMINATES OPERATIONS

• Smooth Finished Parts
• Minimum Machine Run-Out

If you wrote your own specifications for the ideal, all purpose, open hearth carburizing STEEL, it would be . . .

SPEED CASE!

BUY
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BONDS

Operation Eliminated!

These unusual parts were produced on a 6" Automatic with such a fine finish that customer was able to eliminate a subsequent grinding operation formerly necessary when he used SAE X1314. Also, there was no measurable "Run-Out" or Warpage, a condition formerly causing large rejections. Estimated Savings per ton of Steel used, $69.43.

Write for SPEED CASE CATALOG. Actual shop records showing savings of 20 to 65%.

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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

products from ore to the finished product, thus giving the reader a basis of comparison with the past and a starting point from which to speculate on the future.

Strategic sources of alloying elements used in the making of steel are given on maps. It is in this chapter that steel is revealed as an economic weapon, how it is needed by various nations of the world for the manufacture of civilian goods and implements of war. Here is included the reason why Hitler's Wehrmacht first marched into the Ruhr, Norway and the Donets Basin. The strategic importance of alloying elements in regard to the conduction of the war is also presented.

In the final chapters of the book the author discusses the economic future of steel. He sees a gradual transition in the use of steel products, built up from a tremendous backlog of demand for automobiles and the replacement of worn-out equipment for industry and for the railroads. After the tooling-up process for these products has been completed, he forecasts a bright future for steel in fabricated houses, ocean airports, and cargo-carrying air fleets.

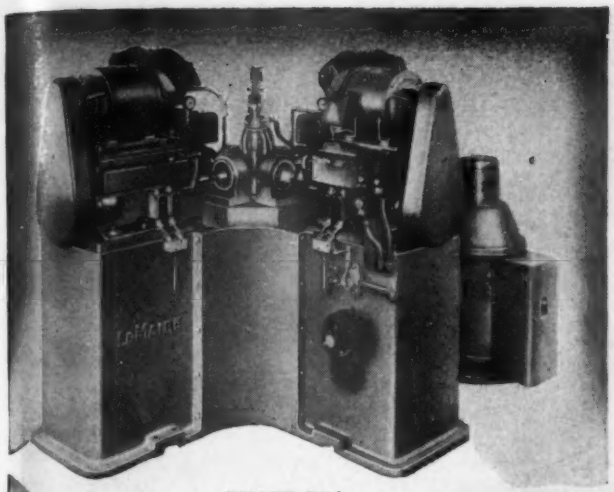
•

INTRODUCTION TO FERROUS METALLURGY, FERROUS METALLURGY, VOL. I—*By Ernest J. Teichert, metallurgist, E. G. Budd Mfg. Company. 484 pages. Published by the McGraw-Hill Book Company, 330 West 42 Street, New York 18, N. Y. $4.*

This is the first book of a series prepared by the author for a three-year college or technical school curriculum on ferrous metallurgy. It covers those fundamentals essential to an understanding of the work to follow in the remaining two books, and includes the primary processing of iron ore in the blast furnace and the manufacture of cast iron, wrought iron, and crucible steels.

General inorganic and organic chemistry as applied to steel making is covered in the first third of the book. Application of chemistry, general physics, pyrometry, metallurgy fuels and their combustion, and refractories, fluxes and slags are discussed in the second third of the book. The remaining portion of the book describes the manufacture of pig iron and the products needed for it, the design and operation of furnaces, the production of malleable cast iron, and wrought iron. In the latter, both the puddling and the Byers' processes are described in detail.

The aim of this series of textbooks is to present a curriculum in the subject of ferrous metallurgy which will be fundamental in nature, factual in text, sufficiently extensive in scope, and arranged in a manner that experience has been found to be most effective in the classroom and home-study courses.



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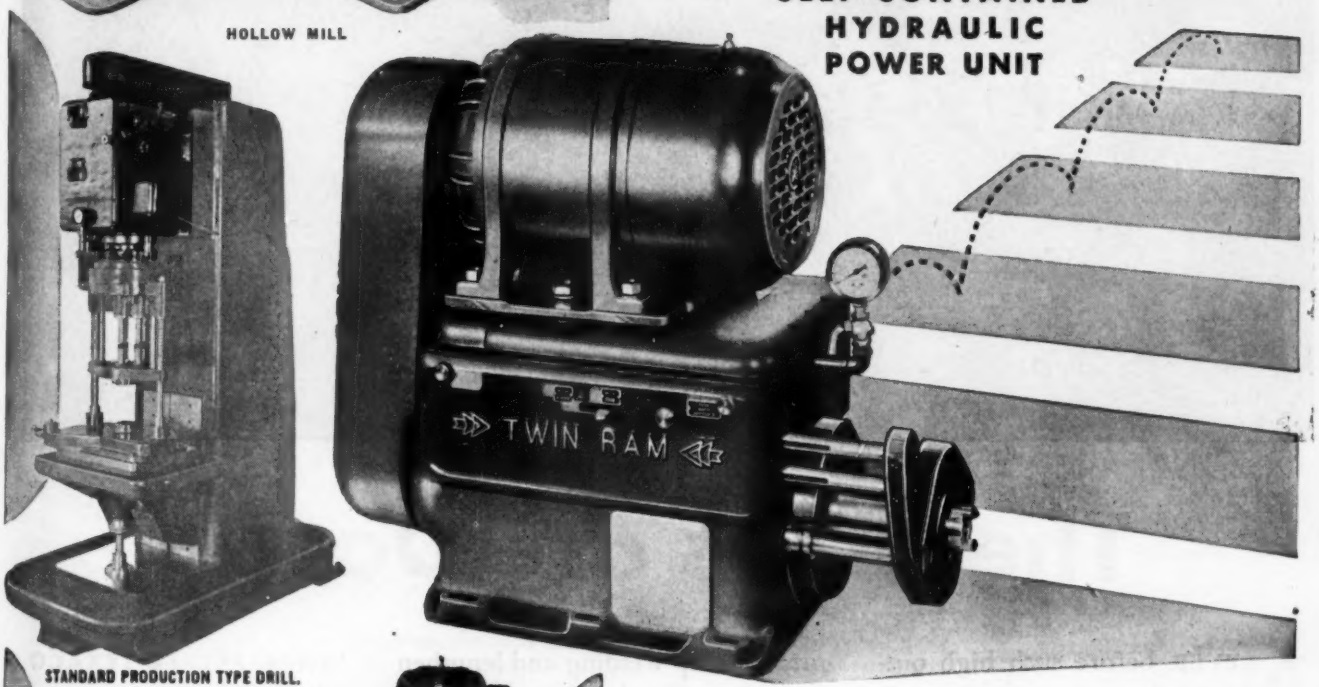
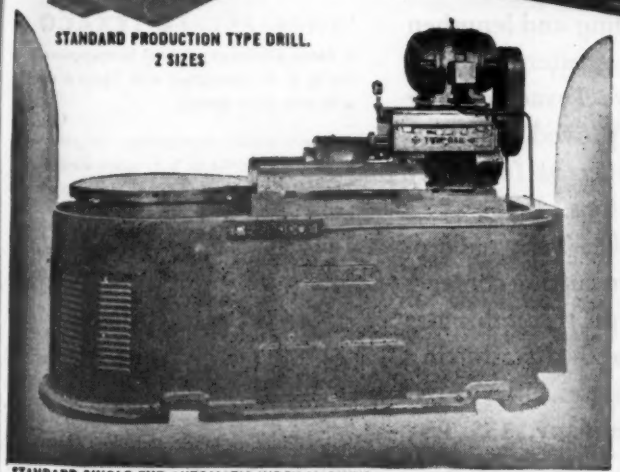
IT'S SIMPLE "To Make"

A MACHINE NOW —if You Have a TWIN RAM MASTER UNIT

A COMPLETE SELF-CONTAINED HYDRAULIC POWER UNIT





STANDARD PRODUCTION TYPE DRILL. 2 SIZES

STANDARD SINGLE END AUTOMATIC INDEX MACHINE

You can change this unit from one base to another, or rearrange your setup on the same bed, as your requirements dictate. It's practically as flexible as a motor; only pick-off gears necessary for speed changes—units provide infinite feeds. Twin Ram Unit can be used for wide range of applications—drilling (single or multiple spindle), reaming, milling, hollow milling, boring, counterboring, spotfacing. Uniform pressure behind load is always in a straight line—the two rams prevent twisting action. Two sizes available. Capacity up to 2" in steel. Can be made to operate manually or automatically by remote control—for either right or left hand operation—with spindle rotation in either direction.

Send for folder giving complete information—spindle speeds and feed rates.

We invite inquiries regarding postwar plans.

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LeMaire TOOL & MFG. CO.

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ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

The Chips are Down

NEVER before such high output of parts made of metal. Never such efficiency in turning them out.

One great aid to faster machining, not available during World War One, is now effected through the use of cutting and soluble oils developed by TEXACO.

Texaco cutting oils permit higher speeds and feeds, with improved surface finish. They lubricate the tools, and by carrying away the heat prevent chip welding and lengthen tool life, assuring greater output.

So superior have Texaco cutting and soluble oils proved that they are definitely preferred for many machining operations.

The Services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States.

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

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TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

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BALL and ROLLER BEARINGS

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FROM 6" INSIDE DIAMETER TO 100" OUTSIDE DIAMETER
COMMERCIAL FINISH OR ULTRA-PRECISION

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Radial Ball Bearings • Thrust Ball Bearings
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to unusual accuracy in large diameters

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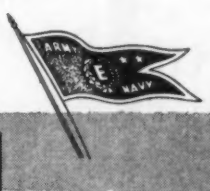

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New in Name . . . Old in Experience

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DIAMOND WHEELS

Resinoid-bonded **for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.**

Metal-bonded **for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.**

Made in all standard types and diameters, in diamond concentrations to suit your requirements.

Catalog on request.

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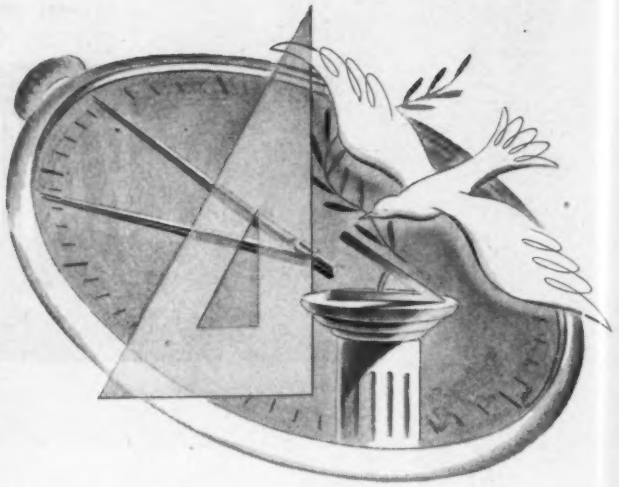

minutes...

VITAL IN WAR ... VALUABLE IN PEACE

No postwar job will ever compare with the urgency of wartime production. For while the war is on, a minute saved may mean a life saved, too.

Yet minutes will still be valuable when peace returns. To save a minute is always to cut a cost. And it is the low-cost producer who will be most successful in the competitive postwar field.

Acme can save you minutes—wartime minutes and peacetime minutes as well. If you need new dies, patterns, heat-treated aluminum castings, Acme can supply them. Should your present or postwar production require special tools, Acme can both design and build them.

Acme consulting engineers have helped many a wartime producer to conquer production line problems. These same engineers will be equally helpful during the critical transition from war to peace.

Preliminary recommendations submitted without obligation.

ACME *Pattern and Tool Company, Inc.*

DAYTON, OHIO

FOR VICTORY BUY WAR BONDS AND STAMPS

HEAT-TREATED ALUMINUM CASTINGS — PATTERNS — TOOLS—TOOL DESIGNING—PRODUCTION PROCESSING

MODERN COLLET *Is Back In Business!*

On Christmas Day of last year, the Modern Collet and Machine Company plant lay in smouldering ruins. Today, the company is again producing collets and feed fingers . . . a new, modern factory is under construction . . . and within a very short time full production will be resumed in all of the various departments which were in operation before the fire.

Over the past few years, more than 5000 concerns have used Modern Products —spring collets, feed fingers, collet tubes, chucking fingers, alloy steel cams, equalizing finger holders, and all other perishable parts and tools for screw machines. Many have had screw machines rebuilt and spindle carriers modernized in the department set up for that purpose.

If you were one of these customers, you found Modern Collet a most dependable source of supply. Consider then how much more you can expect in the future from the same company operating an up-to-the-minute, carefully designed plant in which the newest and finest equipment is installed . . . and with a reorganized management that knows how these facilities must be utilized to meet *your* requirements. Modern Collet is back in business . . . to offer better products and more efficient service than at any time in the company's 22 year history.

MODERN COLLET *and* MACHINE CO.

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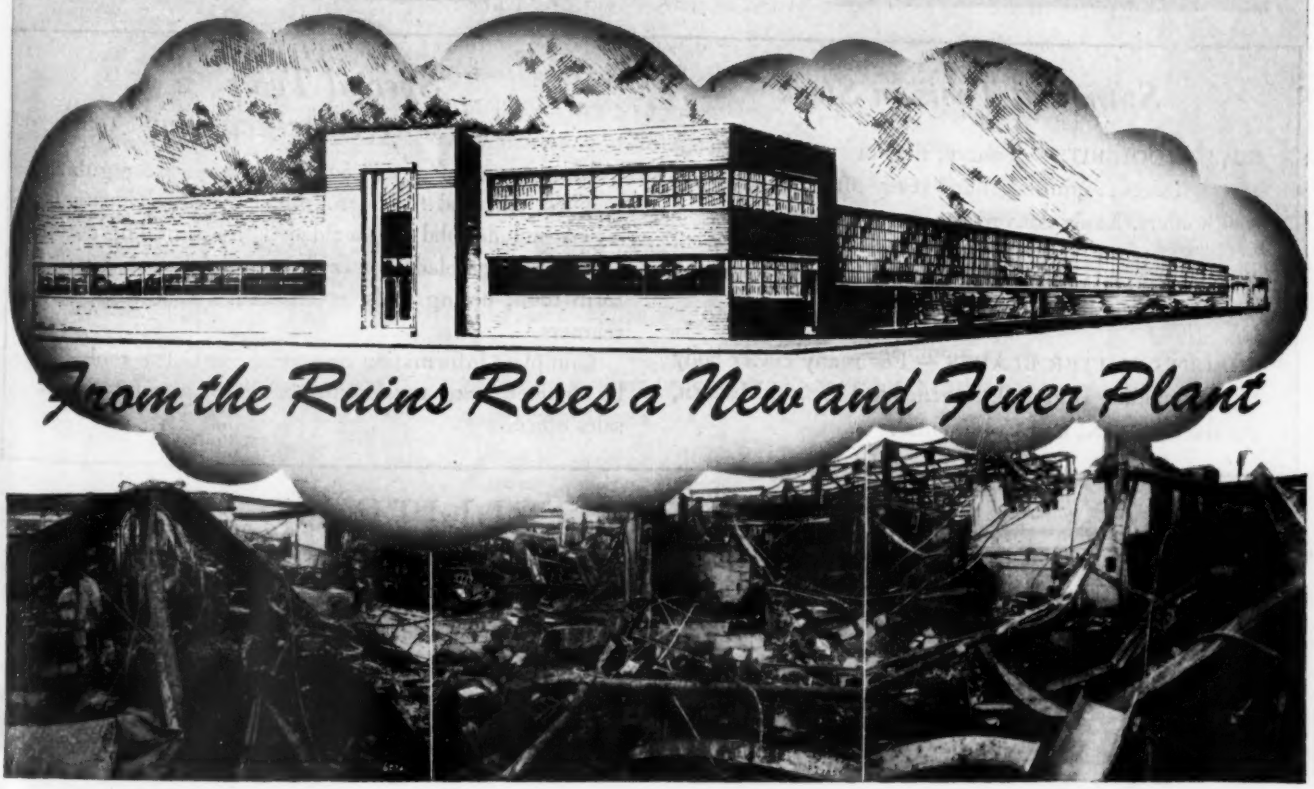


From the Ruins Rises a New and Finer Plant

STELLITE High-Production Cutting Tools *for Low Cost per Piece Machined*

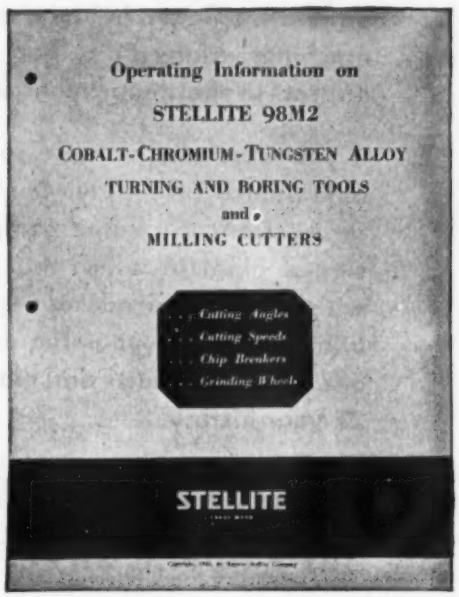
STELLITE 98M2 metal-cutting tools are made especially for faster machining of steel. These cobalt-chromium-tungsten alloy tools are also excellent for brass, bronze, cast iron, and most of the machinable materials. They are generally used for turning, facing, boring, grooving, and forming all these materials, and for milling mild steel, cast iron, brass, and bronze.

STELLITE 98M2 alloy has high red hardness, good edge strength, and unusual toughness. This combination of properties makes possible heavy cuts at high speeds with coarse feeds, which in turn means high production at low cost per piece machined.

Write for copies of the informative booklets about STELLITE 98M2 tools illustrated below.

The booklet (left) describes the type of STELLITE 98M2 tools that are available, including sizes and prices for each type.

Through drawings, photographs, and charts, the eight-page booklet (right) describes the cutting angles, lists recommended speeds and feeds, shows chip-breaker grinds, and gives information on wheels for grinding STELLITE 98M2 tools.



Standard Tools in Stock

SOLID TOOL BITS — Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED-TIP TOOLS — A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES — For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

Special Tools to Users' Specifications

Many types of special STELLITE tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded-tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

Complete information on special STELLITE tools can be obtained from any Haynes Stellite Company district sales office.

STELLITE TRADE-MARK

HAYNES STELLITE COMPANY

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BUY UNITED STATES WAR BONDS AND STAMPS

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

The word STELLITE is a registered trade-mark.

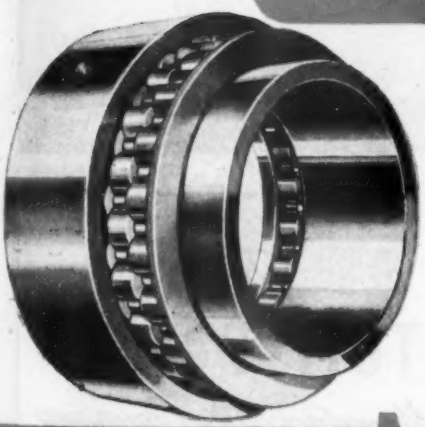
Send for this Helpful ENGINEERING DATA BOOK

Shows Full Line of STANDARD INTERCHANGEABLE SIZES

SPECIFICATION SHEET

MAIN SHAFT: *W-215 Orange Staggered Roller Bearings*

GEARS:



You'll find the answer to heavy duty bearing installations by consulting the Engineering Data Book on Orange Staggered Roller Bearings. This Data Book is built for designing engineers—gives all dimensions, capacities and tolerances in simplified form, set in large, easy-to-read type—shows many typical applications. It explains in detail the exclusive Staggered Roller design, which distributes the load over many small rolls instead of a few large rolls, giving Orange Staggered Roller Bearings greater load-carrying capacity and smoother running than conventional types. Study these advantages before specifying bearings for post-war products.

ORANGE "STAGGERED" ROLLER BEARINGS

FILL IN AND MAIL TODAY

ORANGE ROLLER BEARING CO., INC., 554 Main Street, Orange, N. J.
Please send me a copy of the Staggered Roller Bearing Data Book.

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Title..... .....

Company..... **City**..... **State**..... AM

How to Grind

GEAR-SHAPER CUTTERS

on the Taft-Peirce 6″ Rotary Surface Grinder

Above, T-P Surface Grinder for small rotary work up to 6″ in diameter. Exclusive tilting wheelhead enables machine to do difficult angle and shoulder work.

Immediate right, grinding a threaded hole-type Fellows cutter, with Taft-Peirce adapter.

Far right, grinding a tapered shank-type Fellows cutter, with Taft-Peirce adapter.

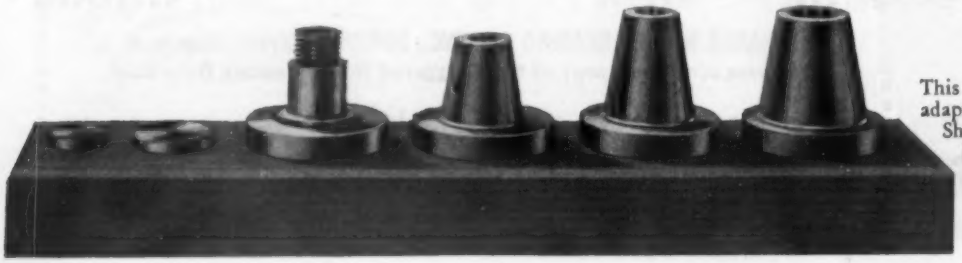
The set of adapters, shown below, makes it possible to grind all Fellows Gear Shaper cutters quickly and accurately on the Taft-Peirce 6″ Rotary Surface Grinder . . . to which the only alternative for this particular type of work is an expensive production machine. Chuck can be tilted 7°, and wheelhead spindle swivels in a vertical plane from horizontal to 30° below wheel center, thus facilitating grinding at any angle encountered in this type of work. Send for prices and delivery dates on Taft-Peirce adapters for grinding Fellows cutters.

The

Taft-Peirce

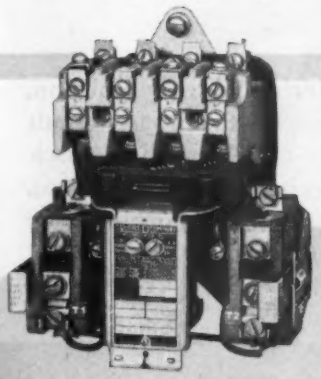
Manufacturing Company

WOONSOCKET, R. I.



This is the complete set of six T-P adapters for grinding Fellows Gear Shaper Cutters. These adapters may be purchased either individually or in sets.

SQUARE D *Announces*
A NEW OVERLOAD RELAY



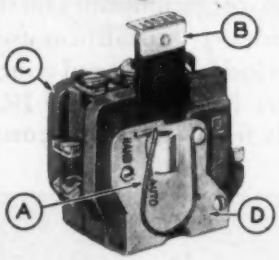
FOR SEPARATE MOUNTING— OR FRONT MOUNTING ON SIZE 0 AND 1 STARTERS

New Type AR Overload Relays provide an easy yet positive method of changing from automatic to hand reset. Adjustability of the tripping point affords greater accuracy of overload protection and flexibility of application. Terminals are large and easily accessible.

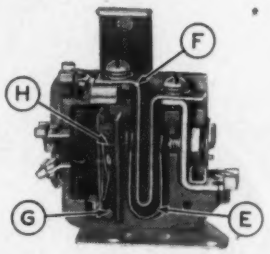
Automatic reset overload relays are useful whenever starters are mounted in remote or inaccessible locations. They are particularly well suited for built-in machine tool control because they eliminate costly external reset mechanisms. No extra charge is made for these automatic reset devices on starters or machine tool control panels.

For complete details call in your Square D Field Engineer or write for Bulletin 201. Industrial Controller Division, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

AUTOMATIC RESET

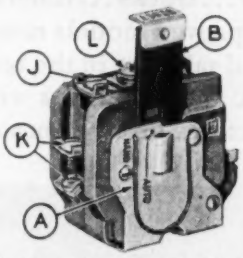


With spring wire clip (A) in hole marked "Auto" and reset slider (B) depressed, relay is in automatic reset position. Insulation blocks (C) are cold molded non-carbonizing material, wax impregnated to prevent absorption of moisture. Steel reinforcing plate (D) protects against breakage and serves as front mounting bracket.

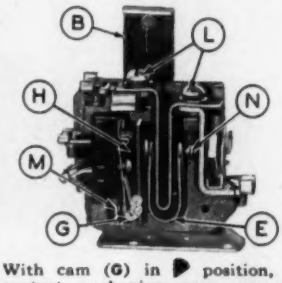


Floating bimetal trip element (E) is "U" shaped to fit around heater (F). This unusual design automatically compensates for any slight variation in shape or location of heater. Change in ambient temperature has little effect on the high temperature bimetal. With cam (G) in ◀ position, contacts will automatically reset after bimetal cools and releases tripping pin (H).

OR HAND RESET



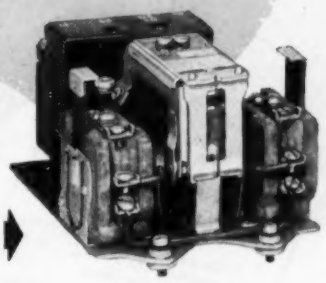
Moving spring wire clip (A) to hole marked "Hand" releases reset slider (B) and provides hand reset operation. Note husky size of load terminal (J) and control terminals (K). Heater units are firmly attached by screws (L) but are easily installed or removed from the front even after starter is mounted and wired.



With cam (G) in ▶ position, the contact mechanism goes overcenter when trip pin (H) is pushed as bimetal (E) expands with heat. Silver contact tips at (M) remain open until operation of reset slider (B) turns cam (G) to ◀. Mechanism is trip-free, thus the snap action contacts cannot be held closed against an overload. Note screw (N) which serves as stop for bimetal, also providing adjustment.

Simple means for adjustment of the trip point from 85% to 115% of nominal rating is a valuable and unique feature of this new Type AR overload relay. It permits changes in setting to take care of variations in ambient temperature or load conditions at the motor. In addition, overload protection is not limited to the usual selection of heater sizes since intermediate points can be obtained, easily and quickly.

Type AR relays are designed for maximum accessibility and ease of wiring. Photograph of starter shows how load terminals are out in front for easy wiring, while control terminals are at bottom, away from other parts. Thus, it is very easy to connect overload relays of several starters in series, or to wire additional relays in the circuit. Likewise, it is easy to convert a standard starter to 2 wire separate control.



ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

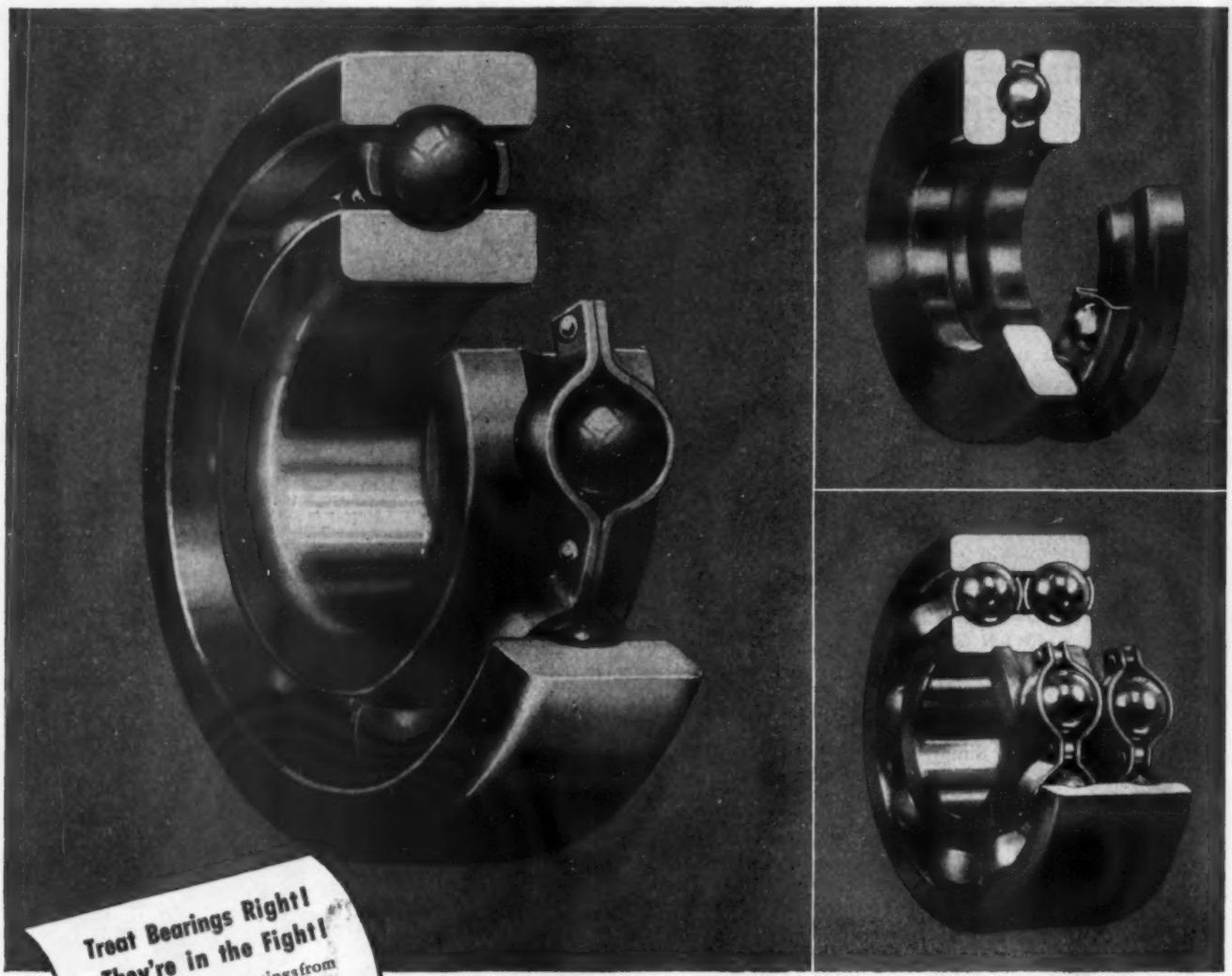
SPEED *Reconversion* WITH BCA BALL BEARINGS

WAR MAY restrict or prohibit your manufacture of machines... equipment ... cars... trucks... tractors. But you can *design* improved models *now* and avoid production and sales lag in the reconversion period.

BCA Ball Bearings are *stable factors* in product design . . . because BCA builds for dependability. Considering bearing function, BCA carefully engineers for load – both amount and direction – and for type of shock condition found to exist in actual service.

Speed your reconversion by planning now to specify BCA Ball Bearings.

BEARINGS COMPANY OF AMERICA, LANCASTER, PA.



Treat Bearings Right! They're in the Fight!

1. Do not remove bearings from wrappers until ready to use. Store in a dry place.
2. Never wash new bearings. Slushing oil should not be removed.
3. When working with bearings, do not lay them down where they may come in contact with dirt. Place on a sheet of clean paper.

BCA

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BALL BEARINGS

How Follansbee **flexibility** can save you time

Prompt answers to your inquiries save you time and money, make your job easier. The ability to adjust production schedules frequently in order to give you the service you want is but another of the many advantages offered by Follansbee.

A manufacturer of tanks was in need of 1,000 tons of alloy steel within 21 days. A telephone conversation with the Follansbee general offices brought him a favorable answer *within the hour*—and delivery was subsequently made as scheduled. Production schedules cannot always be adjusted to accommodate such orders, of course—but a prompt answer can always be depended upon.

When you need an immediate "Yes" or "No," Follansbee will handle your inquiries for alloy steels or other products with gratifying dispatch.

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POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

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MUST BE RELIABLE *Today!*

You cannot afford to take chances with unreliable checking and measuring equipment—particularly surface plates. The depleting ranks of skilled help emphasizes the importance of providing the men you now have with the best surface plates available.

Precision cannot be maintained unless you have reliable measuring equipment. Countless manhours are lost in correcting errors for which manpower should not be blamed.

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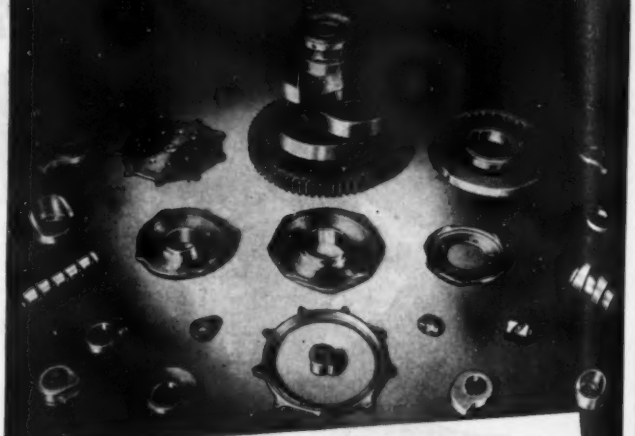
CAMS



LET the largest, most completely equipped cam milling plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

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Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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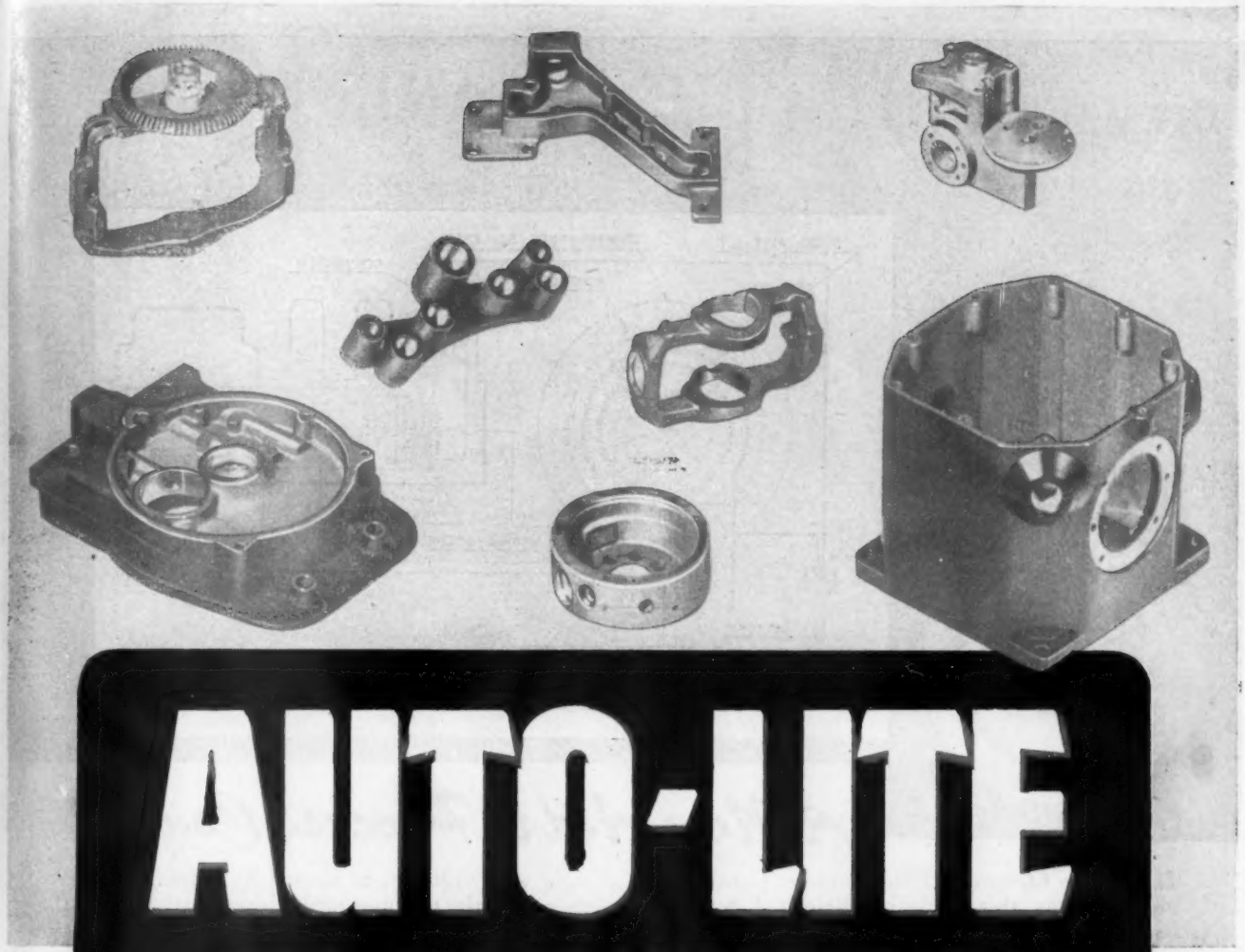

AUTO-LITE
DIE CASTINGS

made with
"CONTROLLED METALS"

Maximum service from Auto-Lite Die Castings is assured by our application of "CONTROLLED METALS." Spectrographic analysis, metallographic studies, X-ray inspection, physical testing, heat treating, etc., are all combined into the production of Auto-Lite Die Castings. This rigid control, even when parts are of intricate design, assures uniform die castings which meet exacting specifications and serve more efficiently wherever applied.

The Auto-Lite Die Casting plant combines under one roof complete facilities for die casting, machining and finishing either from zinc or aluminum. Auto-Lite's wide experience, within the limits of today's wartime demands, is available in adapting and producing die castings to meet your individual requirements.

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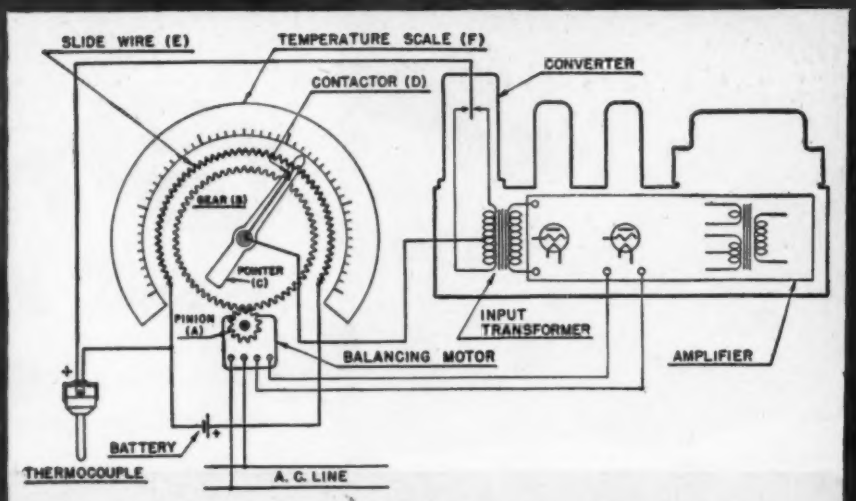
THE ELECTRIC AUTO-LITE COMPANY

Alamite Die Casting Division

600 South Michigan, Chicago, 5 — **Woodstock, Illinois** — **723 New Center Building, Detroit, 2**

Brown "CONTINUOUS BALANCE" Principle

Revolutionizes Temperature Measurement and Control



SEMI-PICTORIAL DIAGRAM OF OPERATING PRINCIPLE

A New Aid to Process Control

The Brown *Electronik* Potentiometer Controller, incorporating this exclusive Brown *Electronik* Principle, is the only potentiometer-type instrument in which the air control flapper mechanism is *continuously positioned* in response to temperature changes.

This new operating principle employs a conventional null-balance measuring circuit, but differs basically from the usual self-balancing potentiometer systems in its balancing operation. Instead of the usual galvanometer and its associated mechanisms, the Brown *"Continuous Balance"* Unit is used—a compact, interchangeable assembly consisting of a conversion stage and amplifier.

Referring to diagram above—Balancing Motor Pinion "A" drives Gear "B" which is *directly connected* mechanically to Indicating Pointer "C," Recording Pen, and slide-wire Contactor "D," hence the balancing motor instantly readjusts the Contactor when required to a new position balancing the measuring circuit.

From the foregoing, it will be seen that the balancing operation continuously keeps pace with changes in the thermocouple voltage—there being no cyclic mechanical motion, no delay is introduced before corrective action can be taken.

Any unbalance between the thermocouple and slide wire voltages, as caused by a temperature change at the thermocouple, is converted into an alternating voltage by the conversion stage (a combination of converter and transformer) of the *"Continuous Balance"* Unit.

This alternating voltage is amplified to such an extent as to secure maximum driving power for a minute unbalance. The phase of the alternating voltage is dependent upon the direction of potentiometer unbalance, and is recognized by the balancing motor, thus determining direction of rotation.

The balancing motor is a reversible, variable speed induction motor, one winding of which is continuously energized by line voltage, the other energized by the amplified alternating voltage, whose phase with respect to the line voltage determines the direction of rotation of the balancing motor. This *"Continuous Balance"* System, providing *sensitivity* of detection, *ruggedness* and *simplicity* of construction, and *precision* in measurement, is incorporated in Brown *Electronik* Potentiometers.

For information write The Brown Instrument Company, *a division of Minneapolis-Honeywell Regulator Company,* 4501 Wayne Avenue, Philadelphia 44, Pennsylvania. Offices in all principal cities. 119 Peter Street, Toronto, Canada—Wadsworth Road, Perivale, Middlesex, England—Nybrokajen 7, Stockholm, Sweden.

BROWN *Electronik* POTENTIOMETERS

PLURAMELT...YOUNGSTER WITH A FUTURE

TODAY, Pluramelt products are entirely allocated for essential purposes. In fabricated form, they're serving in mess trays aboard ship—in field ranges—in kitchen and hospital equipment for the services—in the manufacture of synthetic rubber, high-octane gas, explosives, etc. The list includes both the single and double stainless-armored types.

In each case, of course, Pluramelt is used instead of *solid* stainless steel. The chief reason, therefore, is the very important matter of conservation. Pluramelt saves 60% to 80% of the vital chromium and nickel that solid stainless would consume for the same job.

But there are other prime considerations. Pluramelt in general fabricates easier than solid stainless steel. And, under any conditions of fabrication and subsequent service, it does not—*cannot*—come apart. Pluramelt is unique—a controlled composite steel with an *intermelted* bond that cannot be separated.

Do you want to know more about this stainless-armored steel that is so sure to bulk large in the peacetime manufacturing of the future? Let us work with your engineers and design men to explore the possibilities of Pluramelt in your plans and products.

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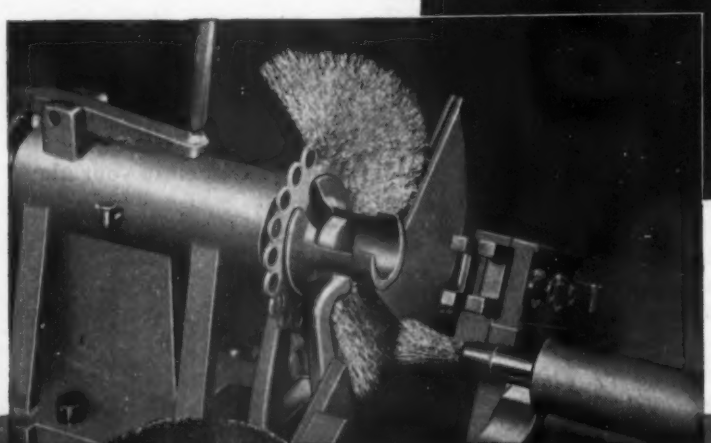
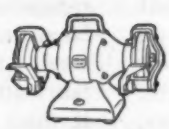
Whirlwinds.

PRODUCTS OF ENGINEERING LEADERSHIP

Black & Decker engineers designed Whirlwind Brushes . . . gave them exclusive, patented features . . . then designed and built special machines to manufacture them efficiently, economically, in quantity. At the right is one of these ingenious machines. Below is a close-up showing how each tuft of wire is inserted and locked in a ring of steel. Other machines press the wires compactly, trim them uniformly, and assemble them in single or multiple sections—the finest, most durable wire wheel brushes made.





BENCH GRINDERS

PORTABLE GRINDERS

Black & Decker

WHIRLWIND

· for High Speed Work!

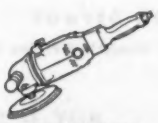
"Electric Tool Headquarters" designed Whirlwind Brushes for the toughest kind of service . . . developed special machines to make them . . . and now industry says they're the finest wire wheel brushes made!

Whirlwind Wire Wheel Brushes . . . developed by Black & Decker engineers . . . have proved on industry's production lines that they are definitely better, tougher, stand up longer . . . on high-speed work of every kind. That's because crimping gives Whirlwind wires extra "life" and "spring" . . . provides correct clearance between wires . . . holds the brush in an even, compact mass. *And each separate tuft of wire is locked securely in a ring of steel!*

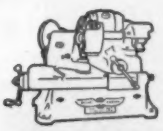
Now more special machines have been built to make Whirlwind Brushes in more sizes and types for a greater variety of industrial uses. Now you can use Whirlwind Brushes—not only on Black & Decker Bench Grinders, Portable Grinders and Sanders—but on most other buffing, polishing, cleaning and grinding machines.

Order Whirlwind Brushes now. Put them to the test on your toughest high-speed operations. And get a demonstration of the extra efficiency, durability and satisfaction that are engineered into every product of Electric Tool Headquarters. There's a Black & Decker Distributor near you, as a ready source of supply. The Black & Decker Mfg. Co., 716 Pennsylvania Ave., Towson-4, Maryland.

ELECTRIC DRILLS

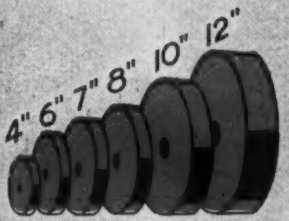


ELECTRIC SANDERS



VALVE REFACERS

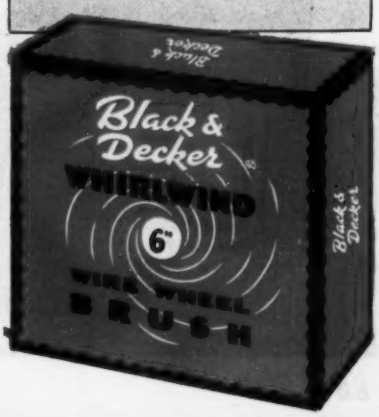
6 Wheel Sizes



3 Thicknesses

3 Gauges of Wire

.005" .0118" .014"



Black & Decker

WIRE WHEEL **BRUSHES**

NOW READY!

CLECO TYPE "P" *Triple-Safe* SHEETHOLDERS

NOW offered by the original American manufacturers of quick fasteners for airplane skin, Type "P" Cleco's have the additional advantage that the parts will not "fly" if the stem breaks. Locked at 3 points, they are *triple-safe.* As in previous types, these Cleco's are repairable and each size is colored differently for quick identification. They can be handled with any style of pliers used in the past. CLECO pliers, always handy and compact, have now been improved further, and are the best obtainable.

Cleco Type "P" sheetholders can also be furnished with longer stems and spreaders for work requiring that a greater thickness be gripped. Standard unit holds thicknesses from 0" to 3/16". A longer stem and spreader combination holds thicknesses of 3/16" to 3/8". A still longer combination holds thicknesses from 3/8" to 9/16", and so on.

Type "P" sheetholders are available in sizes 3/32", 1/8", and 5/32". Parts are either pentrated (self lubricating) or plated —thoroughly rust-proofed. With required priority, shipment is surprisingly prompt. Send for Type "P" bulletin.

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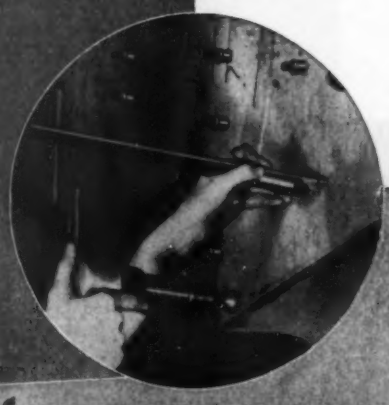
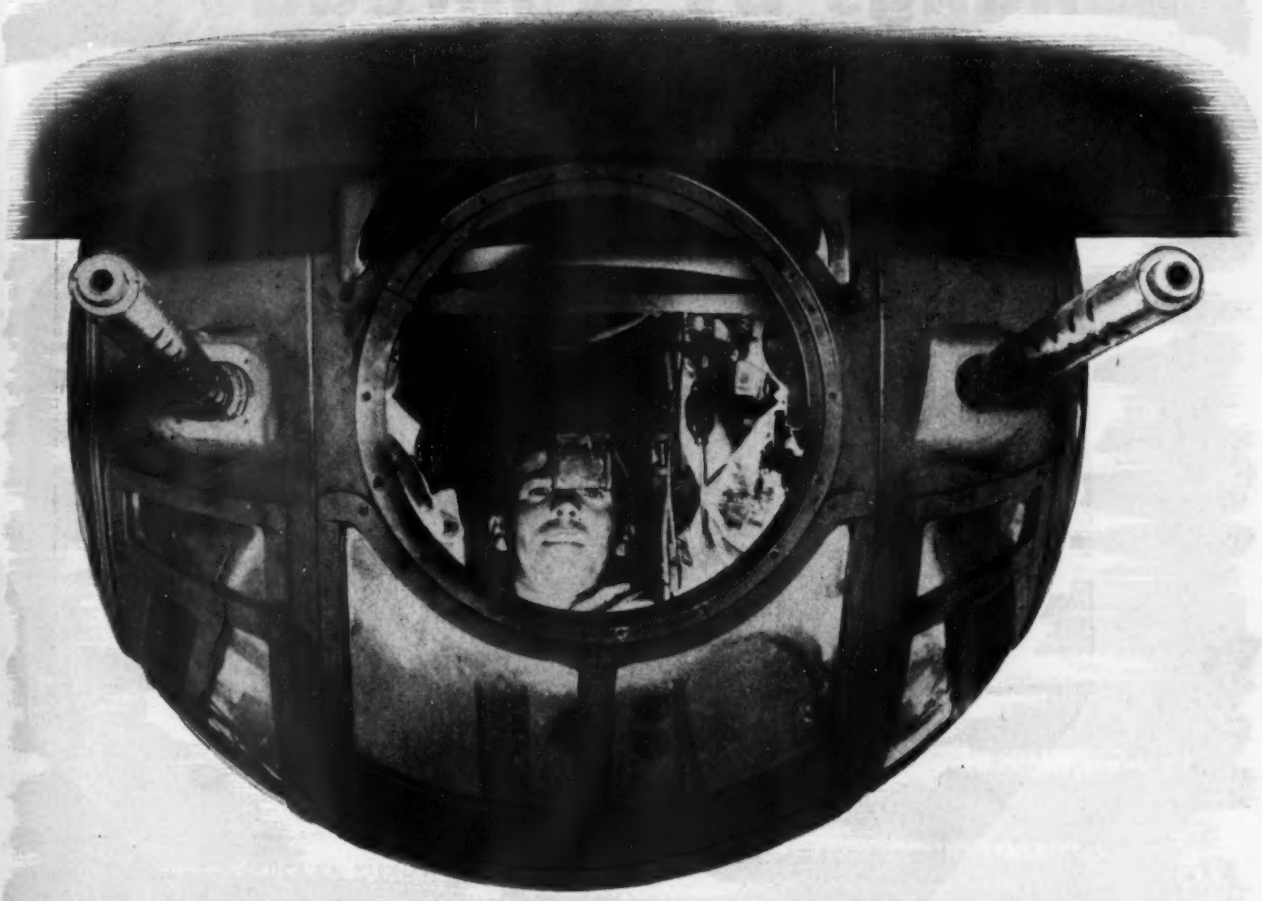
3781 East 77th Street · Cleveland 5, Ohio
Branch Offices in all Principal Cities

BUY U. S. WAR BONDS AND STAMPS



• Teammate with Cleco sheetholders is the RIV-N-JECTOR, astonishingly simple and effective device for reducing rivet losses 90% in aircraft work. Ask for new Bulletin 89.

"Turning Points" to Victory



U. S. Army Air Forces photo

FLYING PEPPER POT

There's no "soft underbelly" on American four-motored bombers. Their belly turrets spell double-barreled death for Nazi or Jap. The turret's range is a complete circle. And, since its turning points are frictionless ball bearings, its response is instant and sensitive for "drawing a bead" on rapidly moving targets.

In a mechanized war, friction can be as destructive as enemy bullets. That is why ball bearings are at the "turning points" of practically every piece of fighting equipment.

Millions of Fafnir Ball Bearings are engineered and built to perform efficiently at fighting temperatures which may vary up to 150° in a matter of seconds. They are also resisting sand, water and mud on fighting fronts all over the world.

Applying this service to the coming needs of peace, a broad prospect of usefulness opens to the manufacturer and the user of Fafnir Ball Bearings. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

Buy War Bonds and Stamps

When DEPENDABILITY hangs by a thread

ARMY E NAVY

We are not thinking of tolerances when we thread a Buffalo bolt or nut. We are thinking that an American boy's life may depend on its accuracy and strength.

Nut maker—designed and built by the Buffalo Bolt Company

BUFFALO BOLT COMPANY

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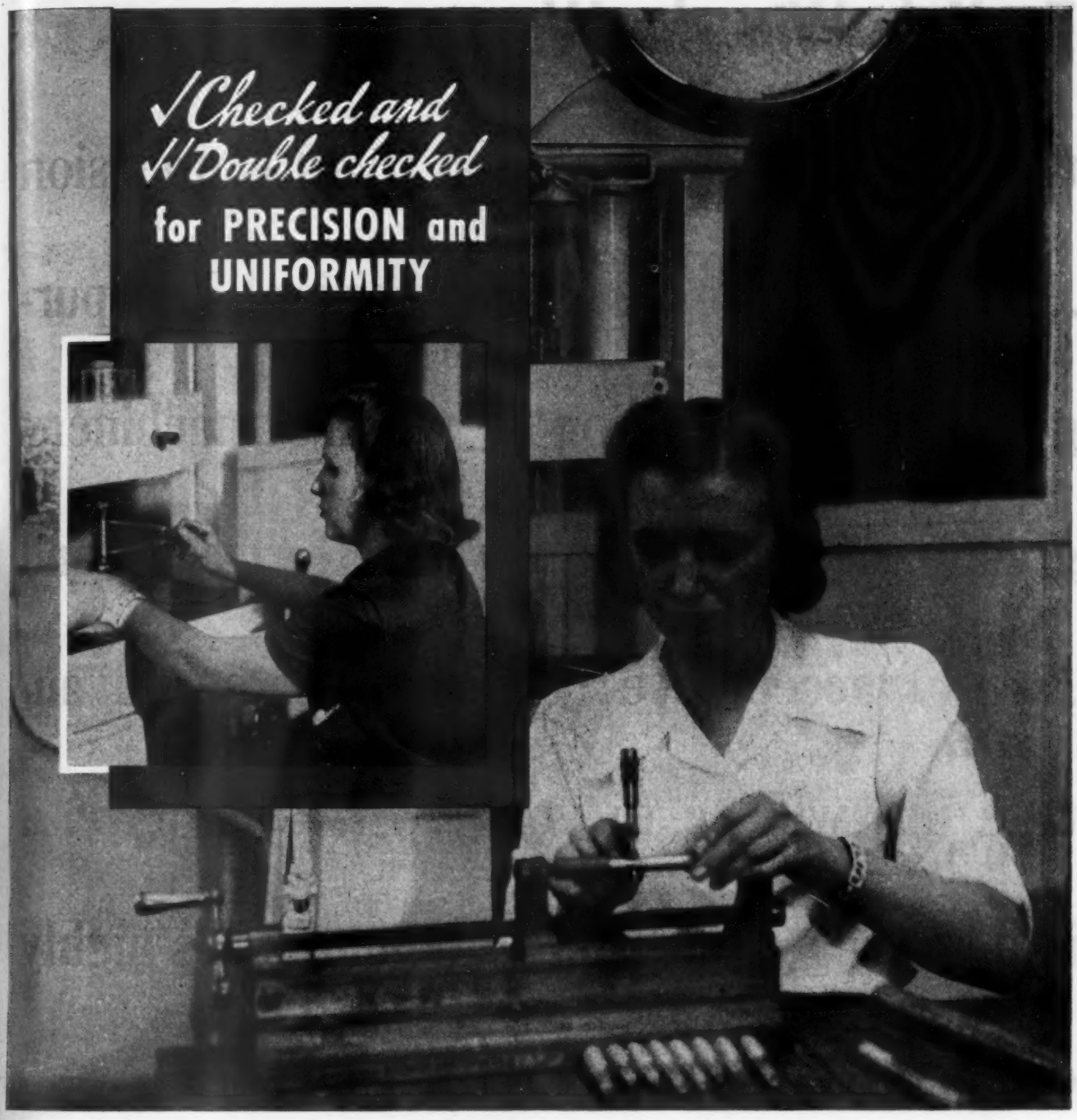

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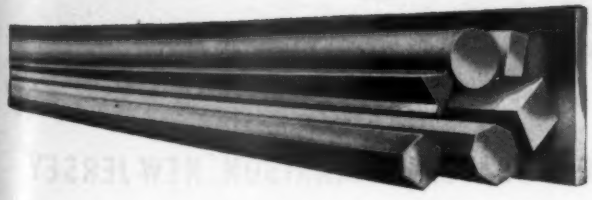

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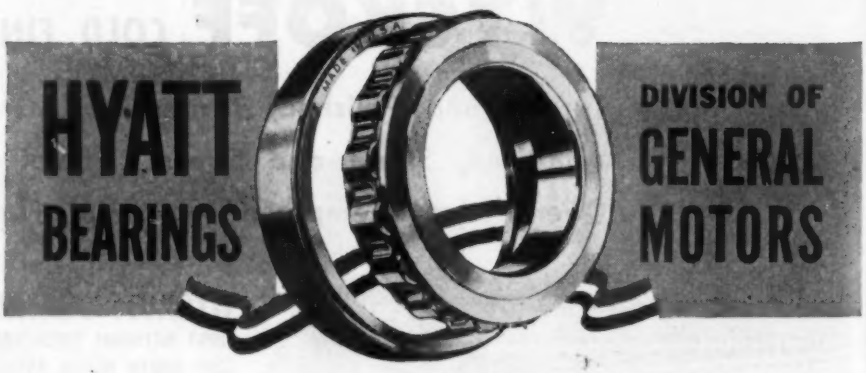
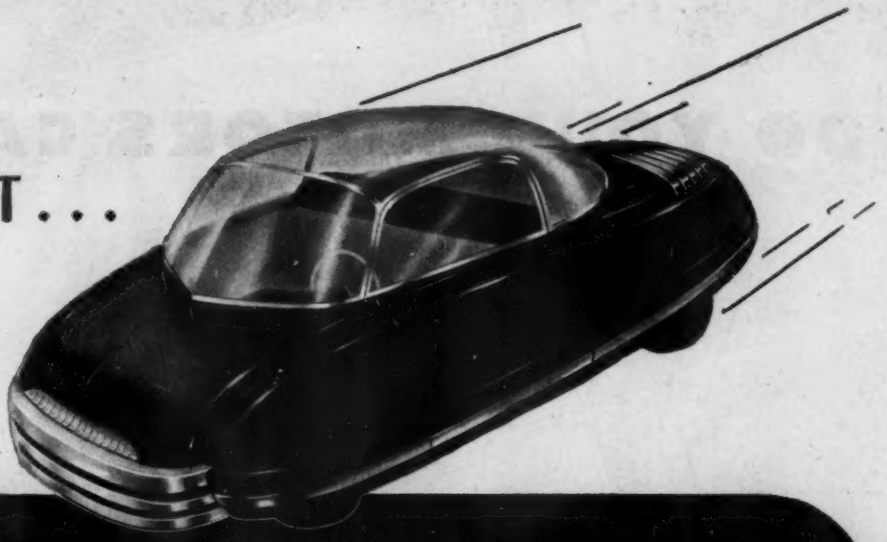
HYATT ROLLER BEARINGS
SERVE SILENTLY,
ACCURATELY, EFFORTLESSLY
WHEREVER GEARS, SHAFTS,
AND WHEELS TURN



HYATT BEARINGS DIVISION · GENERAL MOTORS CORPORATION · HARRISON, NEW JERSEY

I PREDICT . . .



by George W. Walker

Industrial Designer of Detroit

"The car you will own, in what engineers call the *post* post-war period, will take greater advantage of streamlining for beauty and efficiency. Running boards will disappear, permitting wider bodies and more seating room. There will be foam rubber upholstery, soundproofing, opaque colored plastic panels and plexiglass windshields and tops that will provide greater visibility and safety. The small car sketched here is designed with the engine in the rear and enclosed running gear, permitting an extremely short turning radius. The car your War Bonds will buy will be fully air-conditioned, making window ventilation unnecessary and eliminating the present-day annoyance of draughts, rain and dust."

* * *

Note: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the automotive industry, is prepared for the day when its four plants will again be contributing to the country's peacetime automotive needs.

***FREE:** Write on company letterhead for "Seeds Of Industry"—a history of The Weatherhead Company, its many facilities and diversified products.*

Look Ahead with (W)

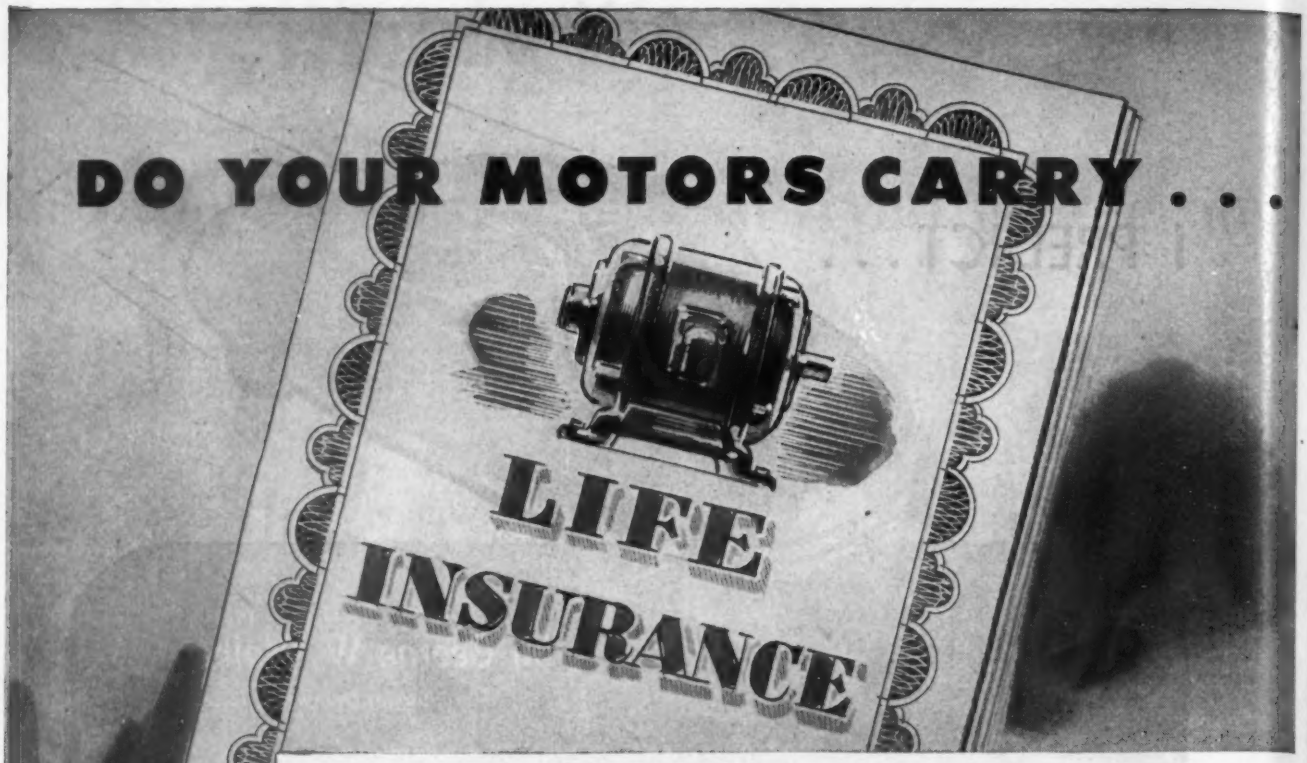
Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries

Plants: Cleveland, Columbia City, Ind., Los Angeles, Canada—St. Thomas, Ontario

DO YOUR MOTORS CARRY . . .



The life of a motor is no longer than the life of its bearings. Bearing failure means motor failure and shutdowns. And the bearings may fail for any or all of the following reasons:—(a) poor design and construction; (b) neglected lubrication; (c) use of lubricant of poor quality; (d) dust and dirt in the bearings.

MOTOR MANUFACTURERS WHO HAVE ADOPTED NORMA-HOFFMANN "CARTRIDGE" BALL BEARINGS ARE PROVIDING THEIR CUSTOMERS IN-BUILT MOTOR LIFE INSURANCE--IN EFFECT, A GUARANTEE OF LONGER, MORE TROUBLE-FREE, LOWER-COST MOTOR PERFORMANCE—because:—

A. The "CARTRIDGE" BEARING is a NORMA-HOFFMANN PRECISION product, designed EXPRESSLY to meet electric motor requirements.

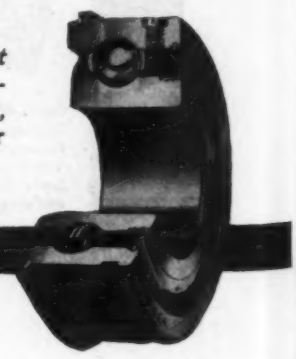
B. With its double-row width, the "CARTRIDGE" BEARING provides WITHIN ITSELF a supply of lubricant at least twice that of any other single-row ball bearing.

C. The "CARTRIDGE" BALL BEARING is loaded at the factory with NORMA "STABILITY-TESTED" GREASE—a high-duty lubricant which has exceptional life and a wide temperature range, and moreover is chemically stable and water-repellent.

D. The highly efficient, wearless metal seals of the "CARTRIDGE" BEARING, so effective in KEEPING LUBRICANT IN the bearing, are equally effective in KEEPING DUST AND DIRT OUT. And they are removable and replaceable, making bearing inspection easy.

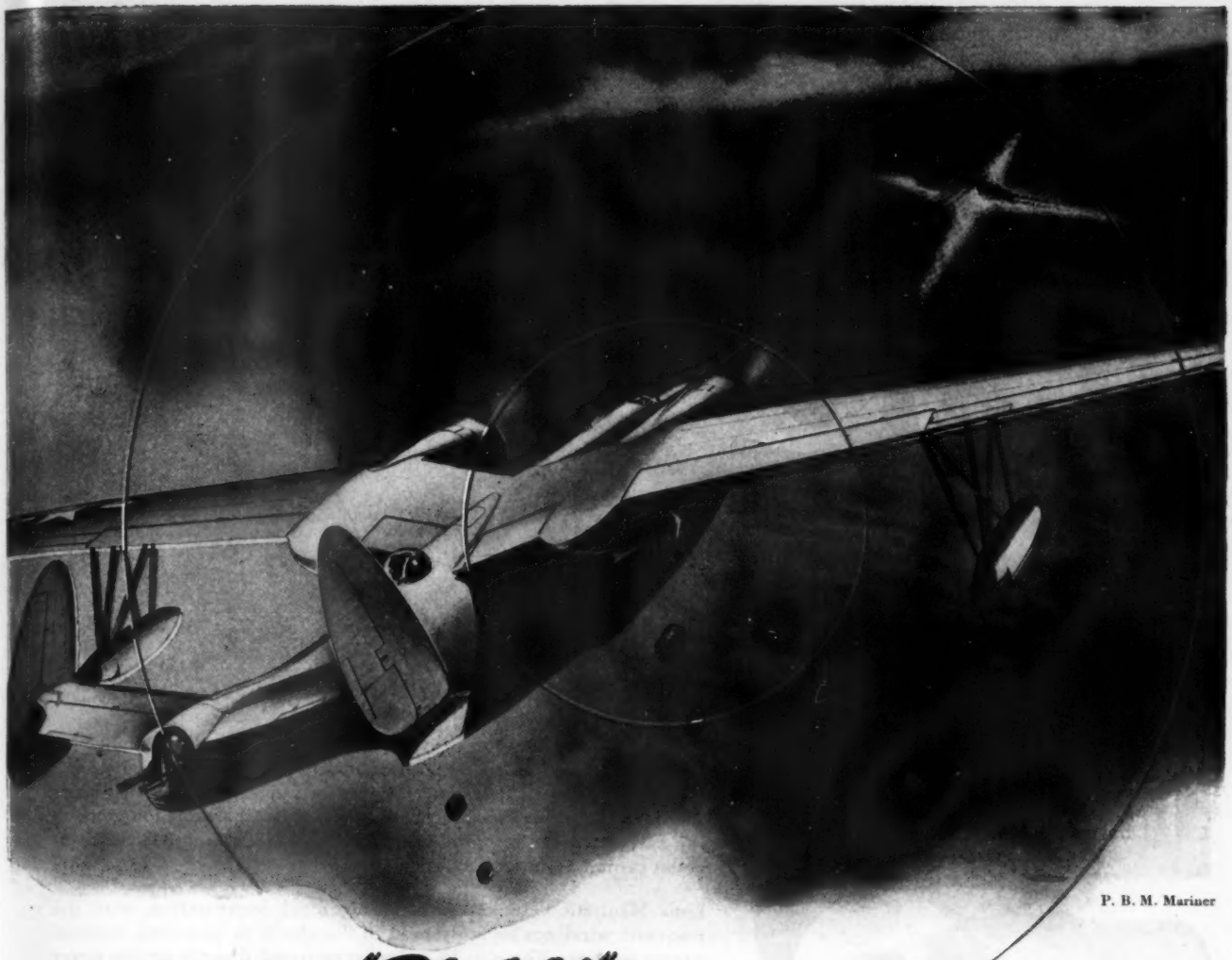
These, and other, distinctive features explain why so many motor manufacturers, seeking to assure their customers MAXIMUM MOTOR LIFE, have adopted NORMA-HOFFMANN "CARTRIDGE" BALL BEARINGS for their latest and most efficient motor models.

Ask for motors carrying the "life insurance" that NORMA-HOFFMANN "CARTRIDGE" BEARINGS provide. They will be a sound and lasting investment, returning good dividends in lower costs, longer life, and freedom from shutdowns.



NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN. FOUNDED 1911

TO WIN THE WAR • WORK • FIGHT • BUY WAR BONDS



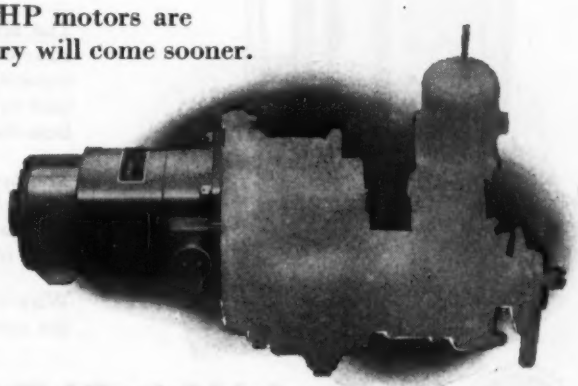
P. B. M. Mariner

TAKING THE "SLAM" OUT OF BOMB BAY DOORS

Bomb bay doors must open quickly and smoothly without jarring . . . *and close without slamming.* Holtzer-Cabot designed a special gear motor to meet these performance requirements which is, today, helping bombardiers blast the enemy.

Many other Holtzer-Cabot special fractional HP motors are providing power for war products so that victory will come sooner.

Our motor development engineers, backed by over 50 years of experience in electric motor design, will discuss your post-war motor problems with you. However, war needs come first and our manufacturing facilities, today, must be strictly limited to building special motors for winning the war as quickly as possible.



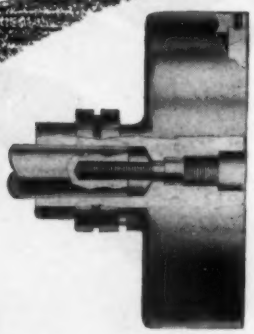
SPECIAL MOTORS DESIGNED TO FIT THE APPLICATION

The HOLTZER-CABOT ELECTRIC COMPANY

Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

125 Amory Street, Boston 19, Mass.; Chicago, Illinois; New York, N. Y.; Philadelphia, Pa.

...with a Chuck that can Take It!



TAPER MOUNTED FOR QUICK CHANGES IN CHUCK SIZES

Lima Rotary Magnetic Chucks, designed for Speedy handling of ferrous metal parts in Polishing, Burring or Lapping operations, make the Lima Magnetic Polishing Lathe a most flexible unit for processing parts or pieces where holding marks of a conventional chuck or collet cannot be tolerated.

Lima Magnetic Chucks are of sturdy steel construction, with the magnetic windings securely held in the chuck to give long uninterrupted service. The chucks are taper mounted directly on the motor shaft, to eliminate run-out and allow for the application of magnetic brake control directly to spindle. Removal of the chuck from motor shaft is accomplished quickly and easily by removing only a single hollow-head cap screw from the center of the chuck shaft (see illustration above).

Lima Magnetic Chucks are furnished in standard sizes 4", 6", 8", 10" and 12". Special size chucks and face plates available, made up to your particular specifications. Interchangeable face plates and register plugs make it possible to process many different sizes and shapes of work, using only a single chuck unit.

The slip rings which convey DC current to the chuck are constructed of cast bronze and thoroughly insulated. The DC supply of current for operation of the chuck is obtained from a built-in rectifier unit in the pedestal of the lathe, and the current is taken directly from the incoming AC lines. No other DC source necessary.

The operations of the magnetic chuck: *magnetizing, starting, stopping and demagnetizing,* are controlled by the LIMA "step-release" foot pedal control which is used in conjunction with the Lima developed relay system for the four cycle operation of this lathe.

Wire or write today for Engineering Bulletin which fully describes the operation and application of Lima Magnetic Polishing Lathes.

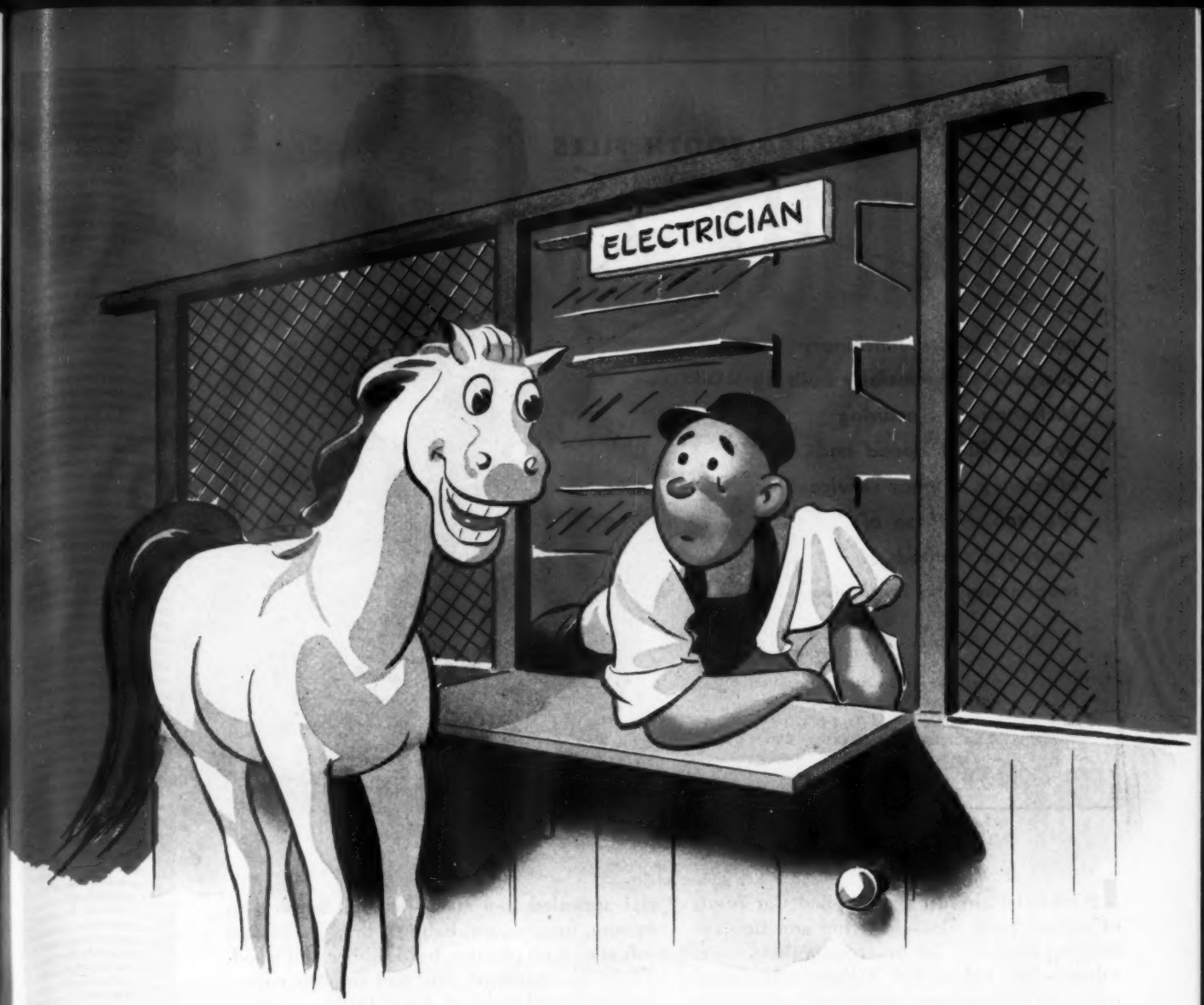
Manufactured by

The LIMA ELECTRIC MOTOR Company

1506 FINDLAY ROAD

LIMA, OHIO, U. S. A.

MAGNETIC POLISHING LATHES . . . GEARSHIFT DRIVES . . . PEDESTAL GRINDERS . . . ELECTRIC MOTORS



"Beefing" Won't Help! You need Horsepower by Howell

ELECTRICIAN: Boy, they're running me ragged. Motors coming in with no insulating varnish on 'em, and no phase insulation. Some of 'em out of balance. Doesn't take much to break those babies down.

HORSE: I know. That's why I want to tell you about Howell Motors.

ELECTRICIAN: Yeah! You better know what you're talkin' about.

HORSE: Every Howell Motor is thoroughly insulated. All our rotors are statically and dynamically balanced—they're precision-built, too.

ELECTRICIAN: Good! But do they stay that way?

HORSE: You bet they do! Good materials—copper rotors, high grade bronze or ball bearings—and careful workmanship insure long life. Ask the hundreds of Howell users in the automobile, ventilation and air conditioning industries, in dairies, grain elevators, shipyards, tank plants—they'll tell you . . . you can always depend on Howell Motors for longer, more dependable operation.

ELECTRICIAN: I know. I've used them. But we haven't got Howells here.

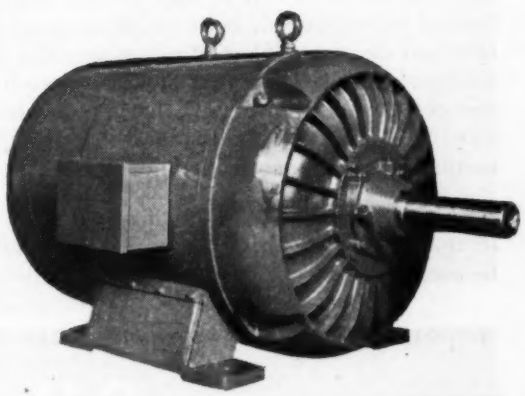
HORSE: Well, quit "beefing" and specify Horsepower by Howell for your next job.

For your specialized or standard motors, phone the nearest Howell representative today, or write the factory. Get the finest motors that money can buy at no premium in price.

HOWELL ELECTRIC MOTORS COMPANY

HOWELL, MICHIGAN

Manufacturers of Quality Motors Since 1915

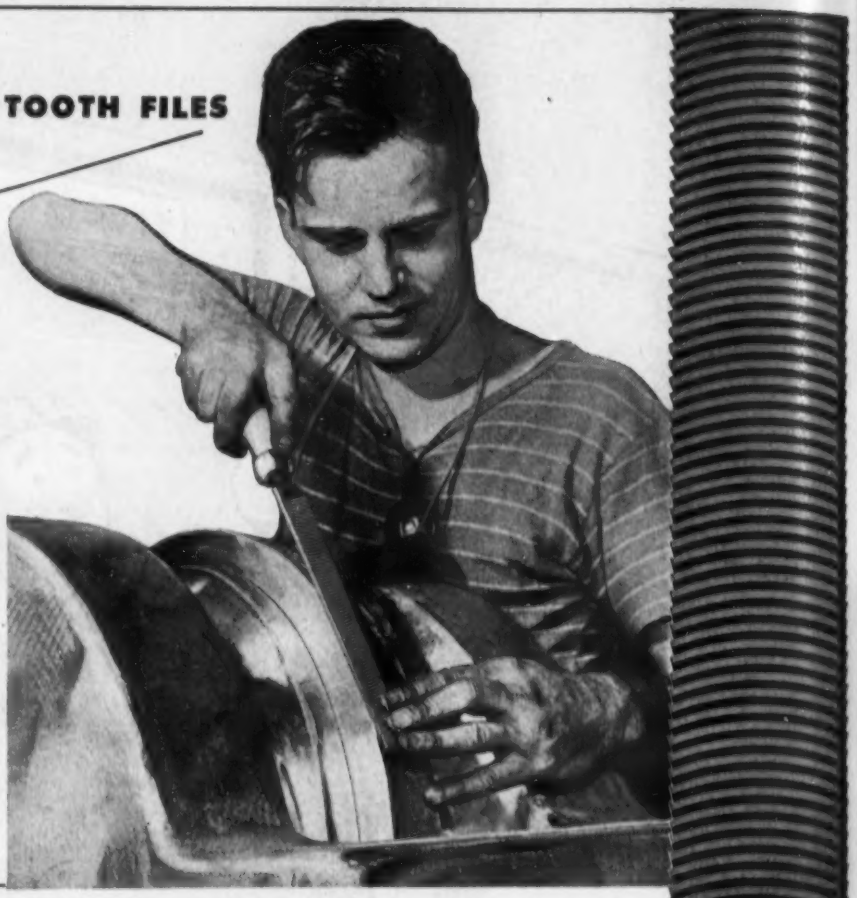


Howell Totally Enclosed, Fan-Cooled Motor (shown above). Available through 125 H.P. . . . all working parts are protected against dust, fumes or moisture . . . Fan cooling prevents undue temperature rise (motor overheating) . . . All steel, streamlined housing provides minimum weight and greater compactness of overall length . . . built to N.E.M.A. frame dimensions . . . special horizontal and vertical fan-cooled motors are available.

Also a wide range of other types of motors up to 150 H.P.

NOW—MILLED TOOTH FILES

made by cutting machinery designed and specially built by Nicholson . . . assuring greater filing speed and efficiency. Longer serviceable life, too, because of improved methods of toughening and hardening.



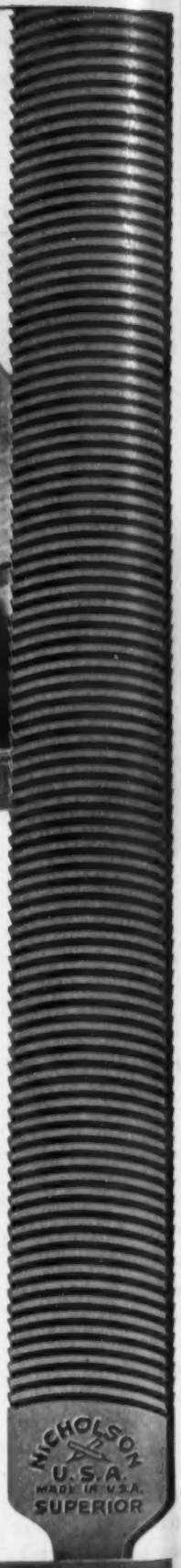
"Mechanic at Brewster Aeronautical Corp. smoothing down a die to form a structural section. True-cut, "razor-sharp" Nicholson Superior Curved Tooth File assures fast, accurate work.

IT WAS the aircraft's multiplied war needs of curved tooth files—for wing and fuselage forming dies, and for other smoothing operations—that led to the Nicholson improvements in their cutting ability and serviceable life.

Improved file-cutting machinery—made only by Nicholson—*mills* in the teeth of today's Nicholson Superior Curved Tooth Files with an accuracy, uniformity and sharpness never before achieved in files of this type. Special attention has been given to proper rake and clearance. Correct curve provides a double-shearing action that makes it easy to prevent the file running off the line. Exclusive Nicholson toughening and hardening methods keep the teeth cutting longer.

Superior quality fully justifies the name of these files—*Nicholson Superior*. They can be used on cast iron, sheet steel and commercial annealed tool steel—as well as on aluminum, magnesium, babbitt, brass, lead and soft alloys; on plastics, hard rubber and wood. There are standard, fine and smooth cuts—for fast metal removal down to fine-finishing of white brass, phosphor bronze and sheet aluminum; for lathe, die, tool and other extra-smooth work.

Besides the aircraft and motor-vehicle industries, Nicholson Superior Curved Tooth Files find wide use in scores of other metal-working industries. There's the rigid tanged type—in flat, square, pillar and half-round cross sections. And there's the blade type—both rigid and flexible—for use in special holders; for flat, concave and convex surfaces; for bearings and for mouldings. Order through your mill-supply house. Special inquiries or problems will be given prompt and cheerful attention. *Send for Catalog Sheet of available types and sizes.*



NICHOLSON FILE COMPANY • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND, U. S. A.
(Also Canadian Plant, Port Hope, Ontario)

NICHOLSON FILES FOR EVERY PURPOSE

No guesswork methods in manufacturing

TALON'S TUBING

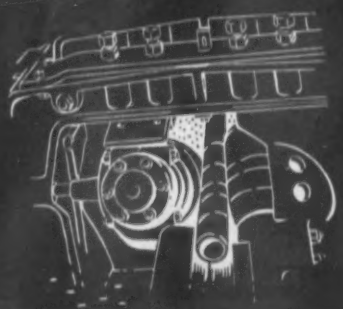
Inspection Stations Plus Thorough Metallurgical Testing Assure Top Quality in Every Length!

1. RAW MATERIAL

Each coil of strip steel must pass rigid inspection for condition of surface, correct analysis, and accuracy of width and gauge to insure that the tubing will be of high quality.

2. ELECTRIC-RESISTANCE WELDER

Continuous vigilance at the welder assures proper heat penetration, size control, and elimination of scratches, offset welds, and other mechanical defects.

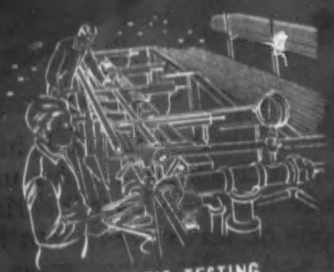


3. STRAIGHTENER

In straightening Talon's Tubing, an operator keeps careful check on the amount of roll pressure since excessive power in this operation would result in variable sizes and ovality.

4. FLANGE TESTING

When cutting to length, flattening, flaring, flanging, and crushing tests are made to make certain that Talon's Tubing will meet customer specifications.



5. HYDROSTATIC TESTING

A trained inspector carefully watches over the hydrostatic test so that not only the proper amount of pressure is applied but also that this pressure is held for the necessary time.

6. FINAL INSPECTION

As a double-check for product accuracy, Talon's Tubing undergoes a final, rigid inspection for size, gauge, length, and surface condition. This assures customer satisfaction.

YOUR INQUIRY TO TALON WILL BRING A PROMPT REPLY.

PRESSURE AND MECHANICAL

TALON . . INC.

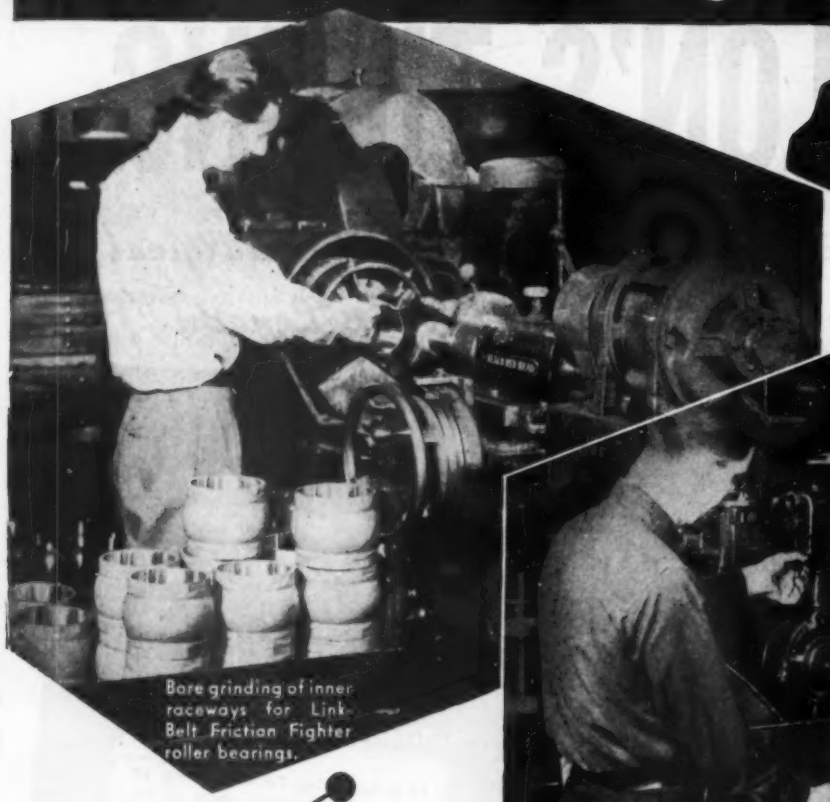
SIZES FROM 5/8" O.D. TO 4" O.D. UP TO 40' IN LENGTH

STEEL TUBE DIVISION

OIL CITY, PENNA.

It has to be Right . .

Photos of Bearing manufacturing operations—Link-Belt Company Dodge Plant, Indianapolis.



Bore grinding of inner raceways for Link-Belt Friction Fighter roller bearings.

Grinding spherical outer surface of inner raceways.

INSIDE and OUT!

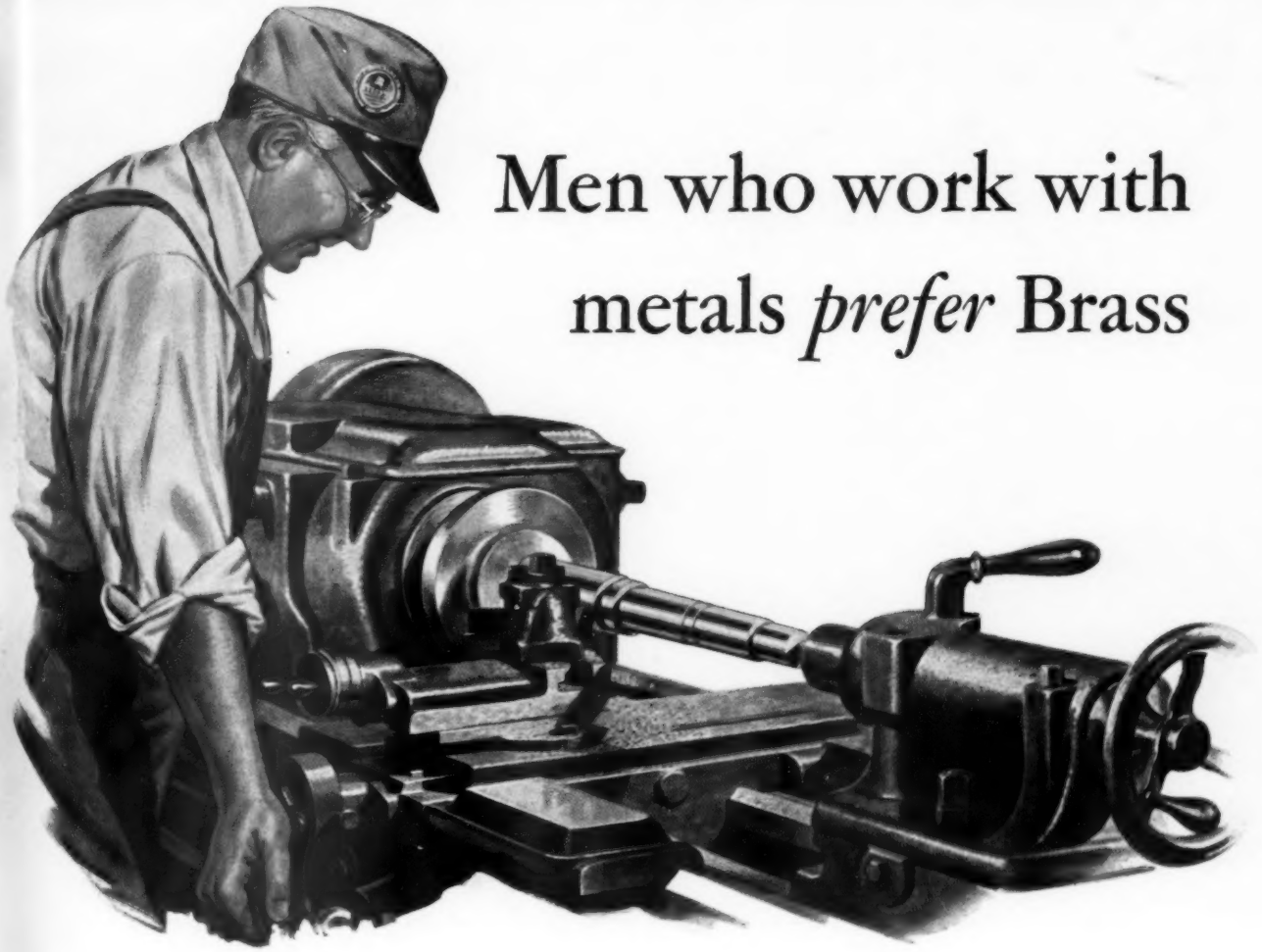
WHEN a bearing carries the Link-Belt name, it has to be *right!* At every step in production, constant checking assures uniform precision within close tolerances; an important factor in long bearing life and efficient performance under all conditions of service. Friction Fighter bearings are made without mountings in ball and roller types or as pillow blocks and units of the cartridge, flanged, take-up, hanger or duplex types. Link-Belt Company, Builders of the most complete line of power transmission machinery. Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Toronto 8. Offices, Factory Branch Stores and distributors in principal cities.

9447

LINK-BELT

FRICTION FIGHTER BEARINGS

Roller and Ball Types



Men who work with metals *prefer* Brass

AND FOR GOOD REASONS, TOO! Brass is strong, durable, workable and dependable. It machines readily and takes an excellent finish. On lathe or milling machine, brass lends itself equally well to heavy roughing operations or high speed finishing cuts.

• For the manufacture of screw machine products, the preference for brass has been established over the years. Multiple and complicated machining operations are being performed economically on modern high speed automatics day after day—in thousands of screw machine shops.

• The ductility of brass makes it the ideal metal for press-drawn products as evidenced by its almost exclusive use for deep-drawn artillery and small arms cartridge cases. And what better material than brass for the rapid and accurate production of blanked, stamped or coined parts?

• On drill press or tapping machine, brass is in a class by itself, and any operator can tell you why: Holes drill faster, drills need fewer grindings; reamers hold their size longer and leave mirror-smooth holes; taps operate at higher speeds and produce clean-cut, accurate threads.

• Yes, brass *is* a workable metal. It can also be rolled, spun, soldered, brazed or welded. Having an attractive color of its own, brass also serves as an excellent, rust-free base metal for almost any applied finish.

• The uniformity and dependability of the yellow metal means faster, more efficient production

Continued on next page

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

ANACONDA

Anaconda Brass Mill Products

All these, and others, too—*from a Single Source of Supply*

Continued from preceding page

—lower overall costs and higher overall quality. It has proved to be the most economical metal to use for a wide range of products—from brass buttons to cartridge cases—and the thousand and one items in between.

• The American Brass Company produces copper, brass, bronze and nickel silver in all standard compositions and in practically all commercial forms. With the composition, grain size and temper adjusted to the requirements, these metals are readily adaptable to most production methods and equipment.

• For applications requiring unusual physical or corrosion resistant properties, The American Brass Company is prepared to supply a special copper alloy such as Avialite*, Beryllium Copper, Tobin Bronze* or its high strength copper-silicon alloy, Everdur*. Your inquiries regarding the properties and applications of Anaconda Metals will receive the close attention of the Company's Technical Department. *Reg. U. S. Pat. Off.

44115

One of these Booklets may make your job easier

Publication B-28, "*Anaconda Copper & Copper Alloys*", a 40-page booklet, discusses the standard alloys made by The American Brass Company, their properties, range of applications, and the forms in which they are manufactured.

Publication B-3, "*Machining Copper and Copper Base Alloys*", is a 32-page booklet giving machinability ratings and suggested speeds, feeds, tool rakes and clearances for basic machining operations. Cutting tool materials are also discussed.

Either one or both of these booklets are available without cost, address:

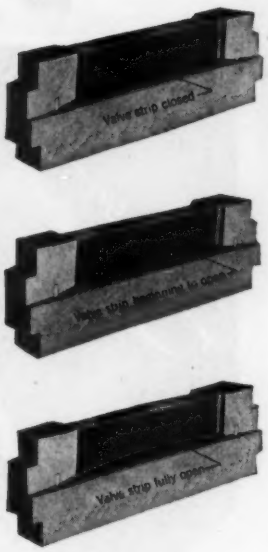
THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

ANACONDA

Anaconda Copper & Copper Alloys

NEW WORTHINGTON HUSKIE PACKAGED COMPRESSORS



The simplest, lightest, most efficient compressor valve ever made. A thin strip of steel seats by increasing contact from each end to the center. No springs, buffer plates or cushioning devices. Fits accurately even when valve seat is warped, and patented end inserts prevent pinching.

For Cooler Running . . . Trouble-Free Operation

Here's a lot of long-lived power, from 400 to 1350 cu. ft. per minute displacement, in a new streamlined "package" specially designed for trouble-free operation, low installation and maintenance costs.

In both 3 and 5-step models, variable capacity control results in the *cooler operation* of Worthington's new Y Angle Type Huskie Compressors. Cylinders are open to cool suction air at most stages of unloading.

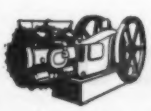
Other Worthington "Outperformance" features include Feather Valves*— forced feed lubrication — filters for uninterrupted oil filtration, non-stop filter-cleaning. Write for more details. Describe your application.

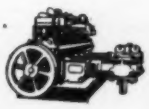
WORTHINGTON PUMP AND MACHINERY CORPORATION
HARRISON, N. J.

WORTH *BEHIND THE NAME* WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON HUSKIE

Y Type . . . Horizontal . . . Vertical . . . Radial — *Portable . . . Gas Engine Compressors . . . Vacuum Pumps*





*Reg. U. S. Pat. Off.

ACA

DEBURR and FINISH by MACHINE

ROTO
THE STURGIS PRODUCTS CO.
STURGIS • MICHIGAN
Trademark Reg. U. S. Pat. Office
FINISH

This picture shows but a small sector of the wide range of deburring and finishing that can now be done mechanically by Roto-Finish. The large castings with their compound surfaces, and the threaded part were deburred, and the curved piece was completely finished preparatory to plating by this revolutionary new process. It works equally well on steel, brass, aluminum, stainless and nickel steel.

In hundreds of plants, Roto-Finish now makes startling savings in time and costs over hand deburring, grinding, honing and buffing. Precision measurements are held, and far more uniform finishes attained. Send for complete information and let us process samples of your parts . . . without charge.

THE STURGIS PRODUCTS CO.
206 JACOB STREET, STURGIS, MICH.

Can Brake Shoe's "Research Group" help with

YOUR *Punished Part* PROBLEM?

BRAKE SHOE'S RESEARCH GROUP

1. *Engineering Laboratory*
2. *Metallurgical Laboratory*
3. *Experimental Foundry*

Every machine has at least one part that takes a special beating. Repeat sales often depend on the wear life of this "punished part."

One of the many activities of Brake Shoe's Research Group is to analyze all the kinds of wear that shorten the life of such parts—corrosion, heat, erosion, impact, abrasion — and to find practical ways to increase wear resistance.

The answer may lie in a new alloy. It may lie in different heat treatment. Or in an entirely different material. It may be a combination of factors.

Where success is achieved, it means for the customer a better product — and for Brake Shoe a new customer.

The resources of Brake Shoe's Research Group, recently enlarged by the addition of an Experimental Foundry, are available to manufacturers whose production calls for large runs of standardized parts.

Consider Brake Shoe As a Source for Postwar Parts in Volume

When it is time to solve your "punished part" problem, remember Brake Shoe may have a contribution to make. You are invited to write to R. B. Parker, American Brake Shoe Company, 230 Park Avenue, New York 17, New York.

AMERICAN **Brake Shoe** COMPANY

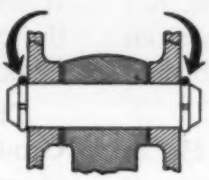
A parts source that may help you meet postwar competition

59 PLANTS SERVING INDUSTRY AND TRANSPORTATION

American Brakeblok Division	Detroit, Mich.
Ramapo Ajax Division	New York City
American Manganese Steel Division	Chicago Heights, Ill.
Brake Shoe and Castings Division	New York City
Kellogg Division	Rochester, N. Y.
American Forge Division	Chicago, Ill.
Southern Wheel Division	New York City
National Bearing Metals Corp.	St. Louis, Mo.
Electro-Alloys Company	Elyria, Ohio

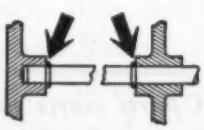
Retaining Rings save money and metal

RETAINING RINGS are being more and more widely used because they are inexpensive and yet so satisfactory on many varieties of mechanisms. Broadly described, a retaining ring is an artificial shoulder or collar on a circular shaft or in a housing. The shaft is grooved, and the ring is snapped on.



The former, and much more expensive method, was to turn the artificial shoulder—cutting down a larger shaft. Now, by simply grooving a smaller shaft and applying a retaining ring a like result is obtained in a vast number of cases.

Furthermore, it has been found much more economical and far more effective to design the cutting tool so as to groove the shaft at the same time that the shaft is cut to its required length—and then to use our steel retaining rings instead of going to the expense of drilling holes for other holding devices that have less strength.



National retaining rings provide an extra safety factor because of our special method of manufacture. They give service that assures economy.

National retaining rings are made of high grade spring steel which is heat treated after forming, rather than from pre-tempered spring wire. Our standard stock sizes will fill nearly all requirements; special sizes and cross sections made at small extra cost.

Write today for our descriptive folders on various types of retaining rings.

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N. J. MILWAUKEE, WIS U. S. A.

MORE than Bearing Metal

● "Bunting" on a Bar of Bearing Bronze in your stock makes it more than merely bearing metal.

Bunting Bronze embodies a tradition of skill and service that enjoys the respect of all builders and users of machinery.

Bunting Bronze appears in the bearings specified by designers of the most advanced mechanisms—airplanes and airplane engines, automotive vehicles and motors, machine tools, electric motors and all the various machines used in war and peace.

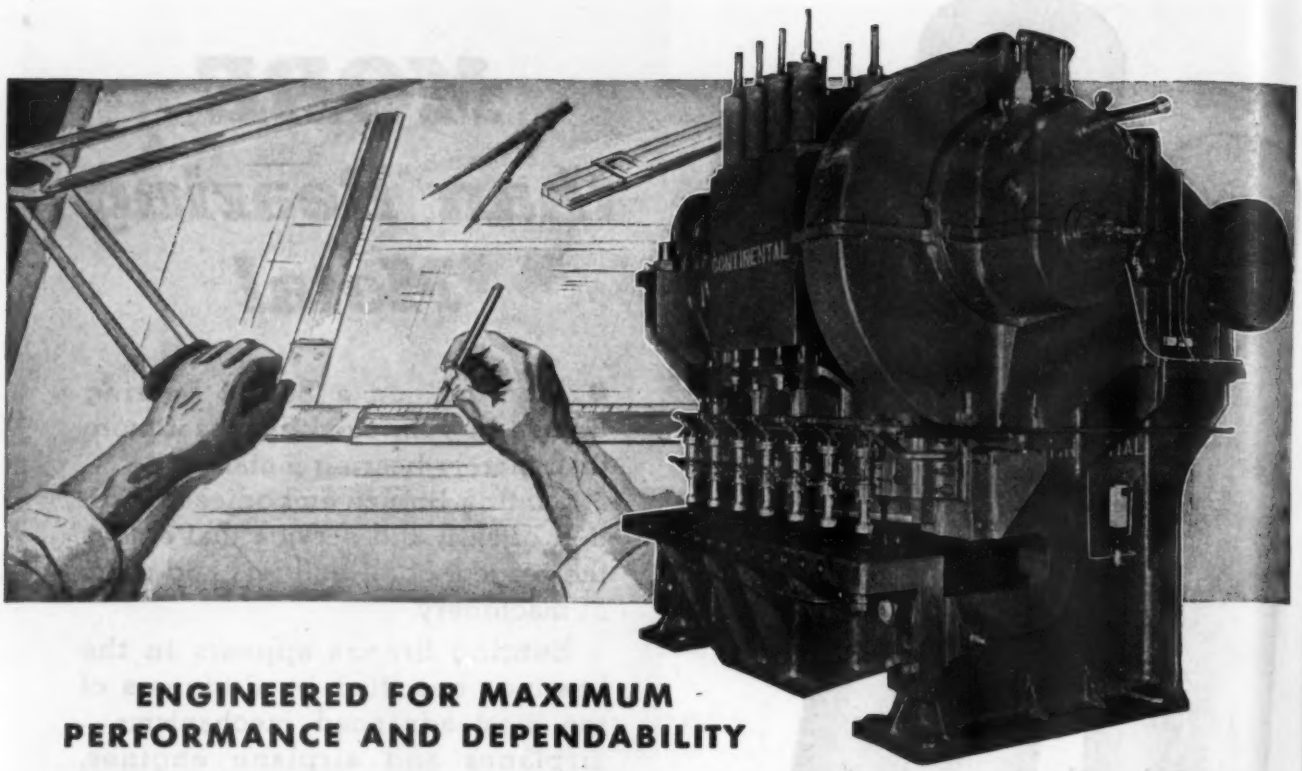
Bunting Bronze means dependable qualities created and fixed by the most advanced scientific methods resulting from long experience and constant research.

Bunting technicians constantly in collaboration with machinery manufacturers and maintenance men are showing them how to use to their best advantage the Bunting Bronze Bars and Standardized Bearings sold by leading wholesalers everywhere. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in Principal Cities.

● Write for the big 64-page catalog of Bunting Bronze Standardized Bearings and Bars available from stock.

Bunting

BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS



ENGINEERED FOR MAXIMUM PERFORMANCE AND DEPENDABILITY

TRABON LUBRICATING SYSTEMS

Offer many design and operating advantages that only Trabon can give you!

● Easy installation is the ***first*** advantage. A Trabon System requires a *single line* of piping only, minimizing installation time and cost.

Secondly, Trabon feeders are entirely enclosed. They have no moving outside parts to corrode or get bent. Trabon feeders do not employ any springs, diaphragms, check valves or levers, and consequently are *free operating* under *all* service and temperature conditions.

Third, the system is operated entirely by the flow of lubricant through the feeders. Although ample pressure is available to lubricate the tightest bearing, the system requires only enough pressure to overcome line resistance, and the load of the individual bearing being lubricated.

Fourth, Trabon Systems assure the positive lubrication of each connected bearing. The Trabon design requires that each feeder *must* discharge to its connected bearing *first* in order to open a port so the lubricant can flow onto the next feeder in the circuit. In a Trabon System, lubricant *positively cannot* pass by any bearing without lubricating it, and go on to the next bearing.

Fifth, because of this design, a *single indicator* placed at the pump where it can be easily seen, gives positive assurance that the entire system is operating properly, thus permitting the feeders to be located in the most advantageous position available, even though they be *hidden from view.*

New fully descriptive engineering bulletins give full details. Send for copies today. Install Trabon—Proven—Best—It meets every industrial lubricating requirement.

TRABON

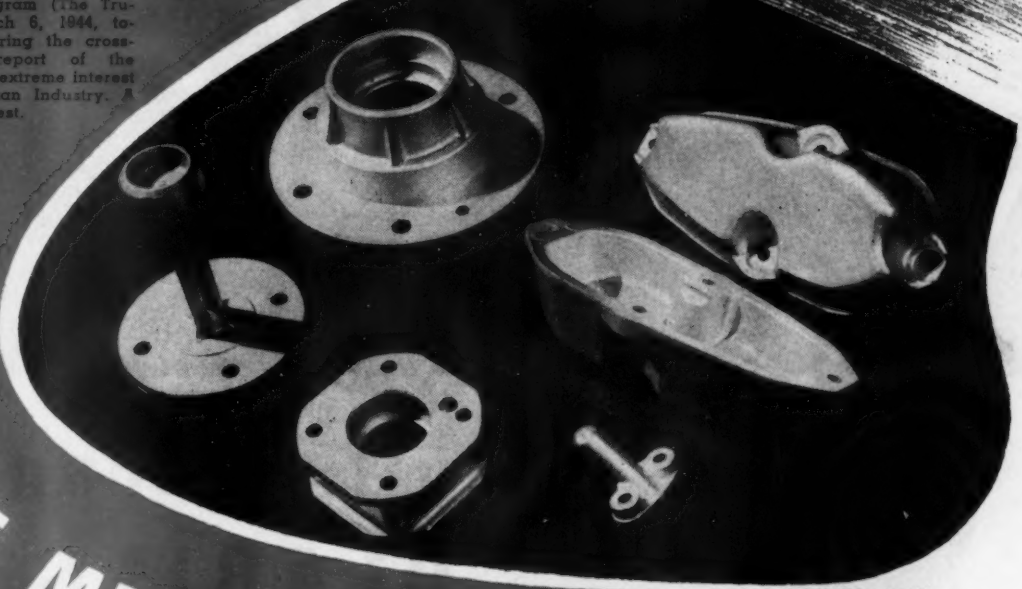
ENGINEERING CORPORATION

1819 *East 40th Street* ◆ *Cleveland, Ohio*

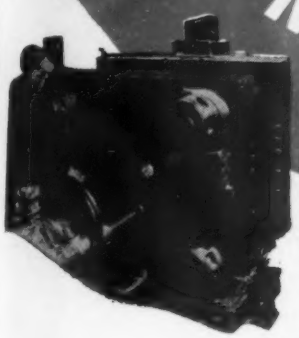
INDUSTRIAL LUBRICATION EXCLUSIVELY SINCE 1922

DOWMETAL *magnesium products*

Available—to everyone interested:
"Dow and Magnesium"—a booklet covering the statement filed by The Dow Chemical Company with the Special Committee of the U. S. Senate investigating the National Defense Program (The Truman Committee) on March 6, 1944, together with extracts covering the cross-examination and the report of the Committee. This book is of extreme interest and importance to American Industry. A copy will be sent on request.



THE METAL OF MOTION



ANOTHER DOW SERVICE . . . DIE CASTINGS
. . . BY AMERICA'S LEADING MAGNESIUM PRODUCER AND FABRICATOR

As the pioneer producers of Dowmetal Magnesium Alloys, Dow developed through years of research, a technique in parts production that helped America get a head start on war necessities. Diecasting of magnesium alloys in Dow's own shops today is helping speed us on to victory.

The virtues of high speed, low cost quantity production are enhanced by the decrease in machining necessary —the dimensional accuracy—the excellent surface finish and the weight saving of Dowmetal die castings. Whether for use on present parts or for those still in the print stage Dowmetal Magnesium Alloys die cast by Dow are ready to go to work for you NOW.

MAGNESIUM DIVISION—THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

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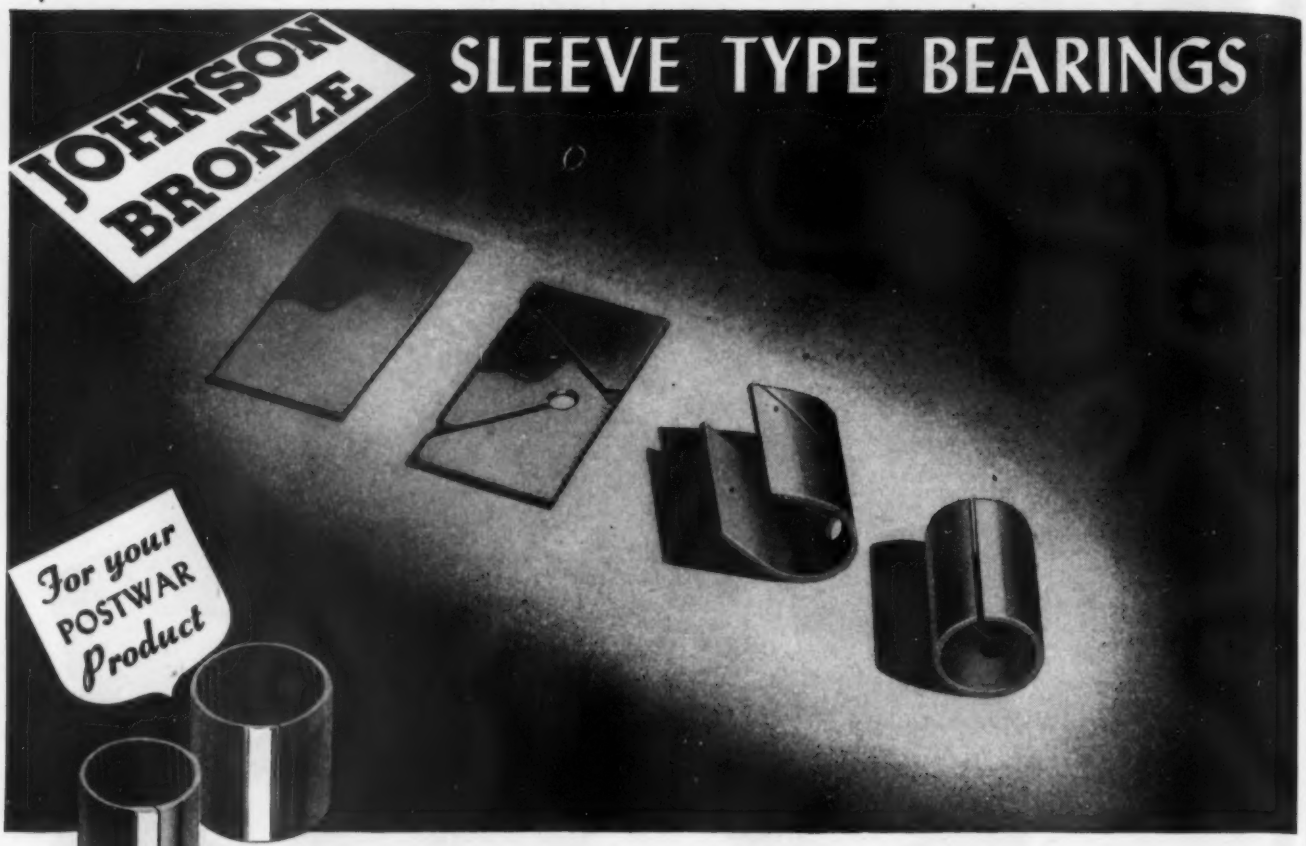

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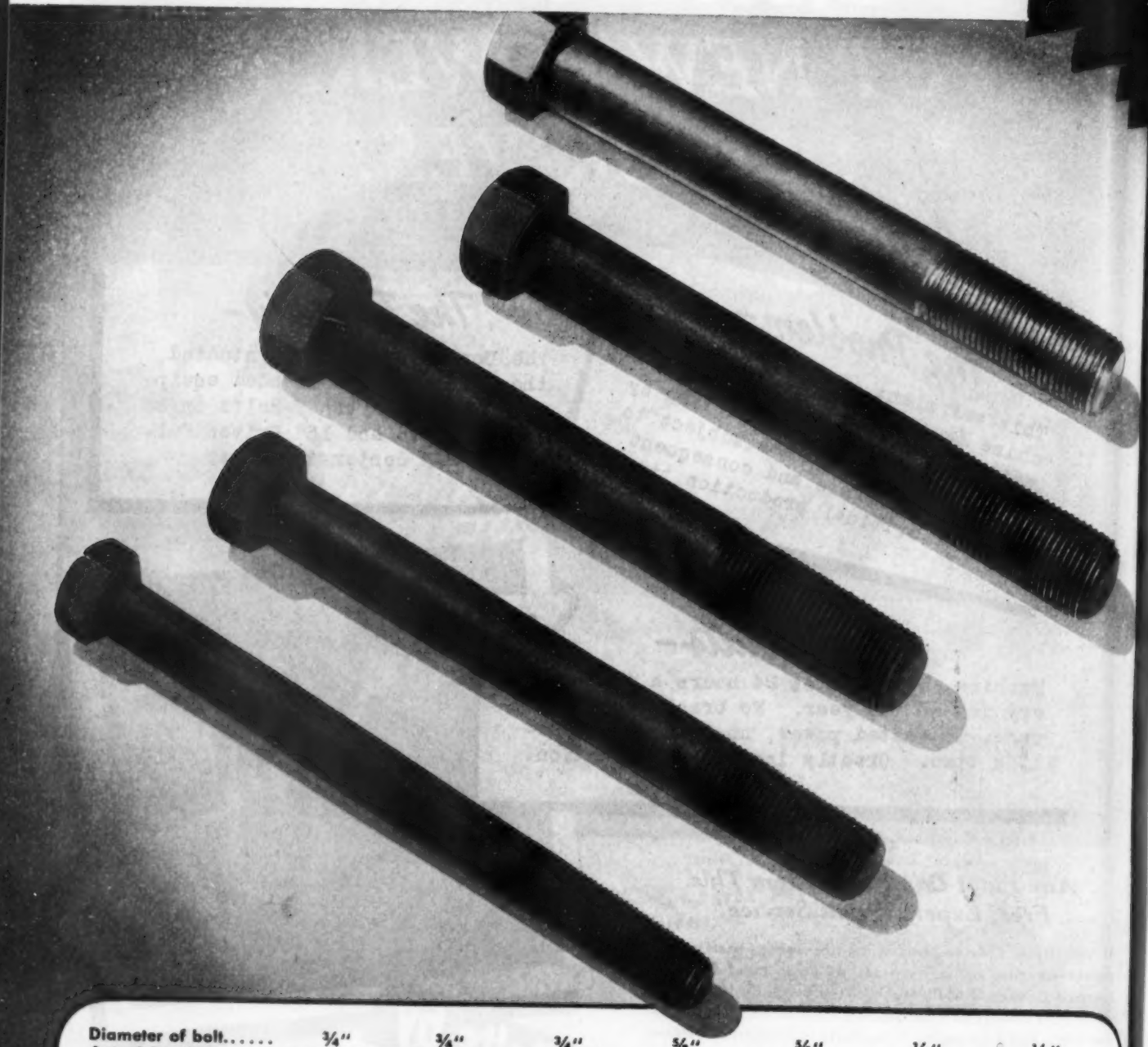

Diameter of bolt	¾"	¾"	¾"	⅝"	⅝"	½"	½"
Actual breaking load	26,300 lbs.	43,900 lbs.	52,600 lbs.	30,000 lbs.	36,000 lbs.	18,600 lbs.	22,300 lbs.
Weight per 100 bolts	85 lbs.	85 lbs.	85 lbs.	58½ lbs.	58½ lbs.	37 lbs.	37 lbs.
Ultimate tensile strength	75,000 psi	125,000 psi	150,000 psi	125,000 psi	150,000 psi	125,000 psi	150,000 psi
Material	SAE 1020	SAE 1035	SAE 3135 or NE Equivalent	SAE 1035	SAE 3135 or NE Equivalent	SAE 1035	SAE 3135 or NE Equivalent
Heat treatment	None	Quench, draw	Quench, draw	Quench, draw	Quench, draw	Quench, draw	Quench, draw
Threads per inch	16	16	16	18	18	20	20
Root diameter	0.669 in.	0.669 in.	0.669 in.	0.553 in.	0.553 in.	0.435 in.	0.435 in.
Area at root diameter	0.351 sq. in.	0.351 sq. in.	0.351 sq. in.	0.240 sq. in.	0.240 sq. in.	0.149 sq. in.	0.149 sq. in.
Length under head	6 inches	6 inches	6 inches	6 inches	6 inches	6 inches	6 inches

Above data shows essentials of some of the timeliest advice given by Lamson engineers. It shows how and why a smaller bolt using 57% less steel will carry the same load in tension as the larger bolt!

..AND ARE ALIKE, IN SIZE...BUT VHAT A DIFFERENCE YOUR LAB- RATORY WOULD FIND IN THEM!

• Three of these bolts photographed have exactly the same dimensions—¾" x 6"—*and there their resemblance ends.*

We have arranged them in the photograph to match up with the table of their physicals, at left, below, where you may compare these three bolts, point by point. And in the variation of their physicals lies your opportunity to profit by Lamson & Sessions' "know how", always at your command without obligation.

It is obvious that bolts in larger and smaller sizes than those shown, made of the same materials, made the same way, properly heat treated, will develop proportionately the same physicals and characteristics as these three bolts.

What about the fifth and smallest bolt? We'll tell you. Note that it also is the same length as the others, but it is only ½-inch in diameter, or less than half the weight of the bolt made of SAE 1020 steel with corresponding physicals! It will carry approximately the same load in tension as the larger bolt.

Do you want to save weight in the bolted assembly you are laying out? Do you want to save critical materials and get faster deliveries? Do you want to use every means in conserving war materials?

If you will apply the principles involved in modern bolt engineering, and design for, and specify, a bolt having the required strength you need in the smallest possible size—you will have accomplished all three objectives mentioned above! Saving weight is a prime objective today whether you're building a bomber, a tank, a gun carriage, a ship or anything else—and you can save weight if you can design to use a bolt one-half the size *you thought you needed.* Requiring less material, by 50%, than its larger counterpart above, having the same strength—the fifth bolt shown, if we made it for you, would allow us to draw that much less upon critical materials; we would need a smaller inventory of materials, and less shipping space would be needed for the finished bolts because we can ship twice as many bolts in the smaller size than the larger size. A whole train of favorable circumstances is set in motion when you let bolt engineers help you engineer a smaller bolt into your designs!

Ask Lamson engineers for solutions to your fastening problems. Maybe out of their vast experience they can help you. Lamson "know how" is at your disposal *now, and after the war is ended.*

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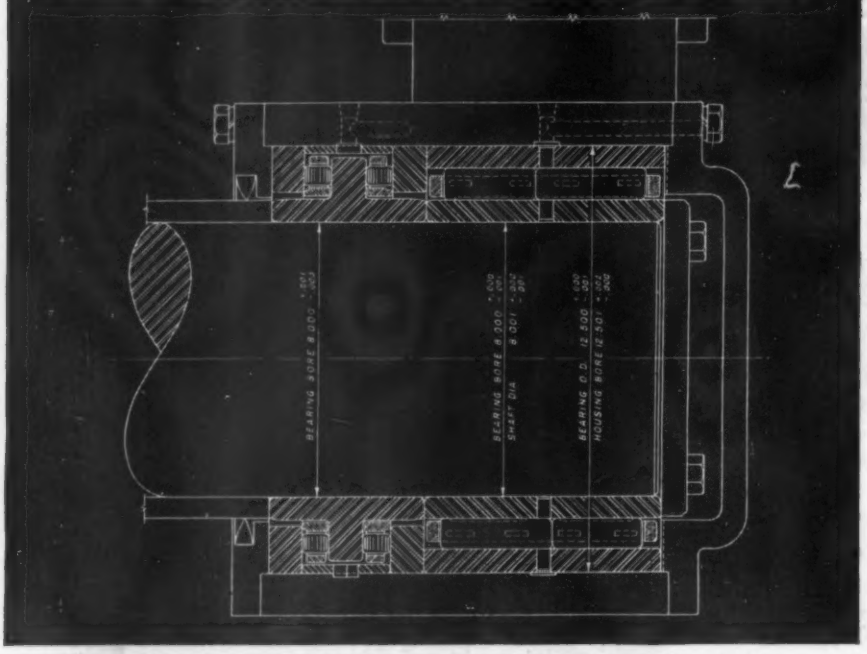
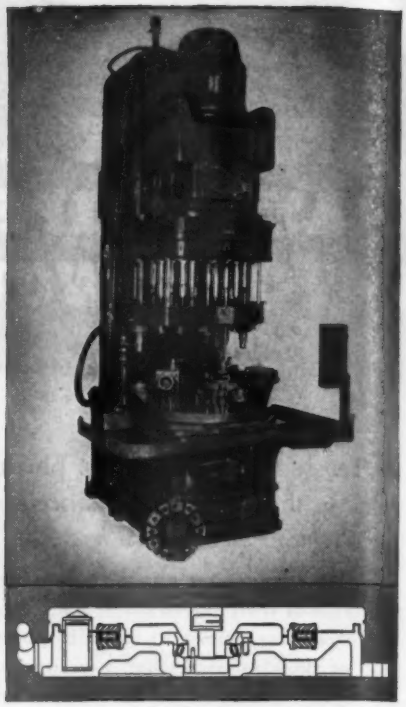
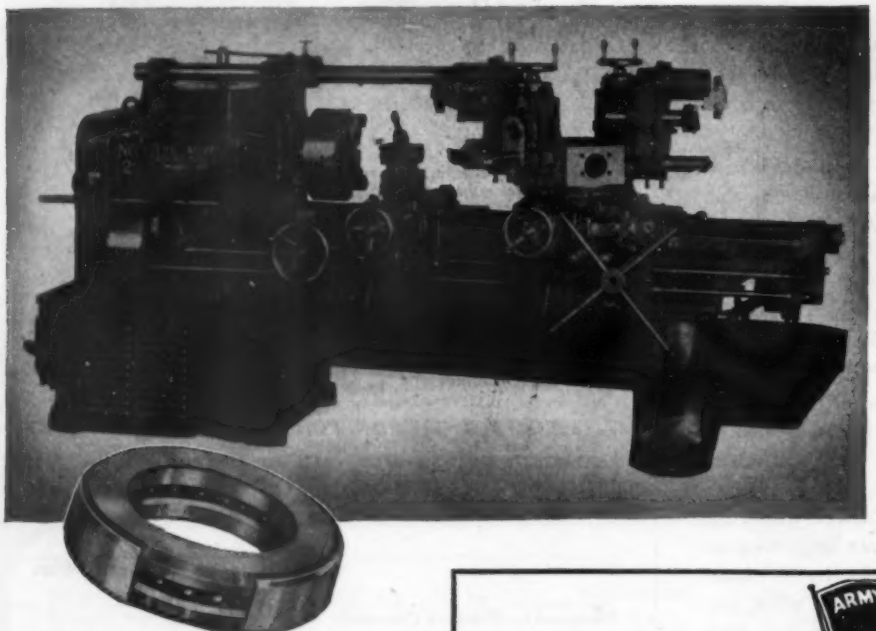
IN THE NEWS
WITH TORRINGTON BEARINGS



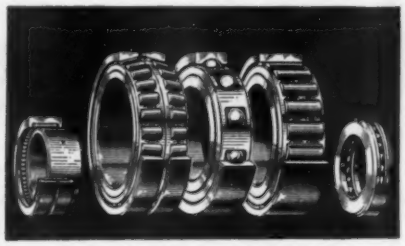
270,000 POUNDS RADIAL LOAD and 168,000 pounds thrust load is the capacity of this compact, 12.5" O.D. Torrington Mill Type Bearing designed by the Company's Bantam Bearings Division to carry the work rolls of a new design axle-type rolling mill in the steel industry. This is another interesting example of the ability of Torrington engineers to design and build anti-friction bearings to meet new and specialized requirements.



MULTIPLE STATION DRILL PRESS, built by Snyder Tool & Engineering Company, uses large Torrington Roller Thrust Bearings to provide anti-friction operation for the rotary table and insure sturdy support to the "work." Bearing, as shown in cross-section, is supplied in three sizes to meet the requirements for both hand and power indexed tables.



FOR ANTI-FRICTION OPERATION on the long and cross feed shafts of this Universal "Cincinnati Acme" Turret Lathe, built by The Acme Machine Tool Company, four Torrington banded Ball Thrust Bearings are employed in each apron. This type of Ball Thrust Bearing as shown in inset is supplied by Torrington's Bantam Bearings Division in a standard range of sizes from ½" to 3½" I.D.



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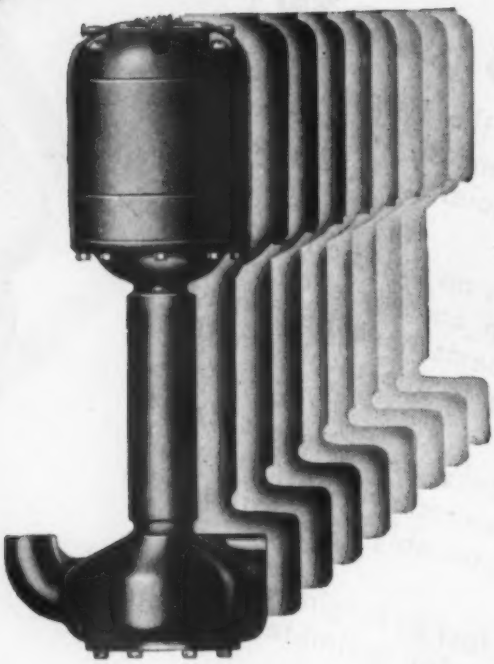

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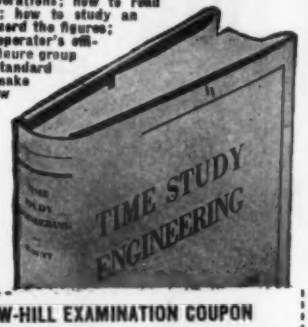

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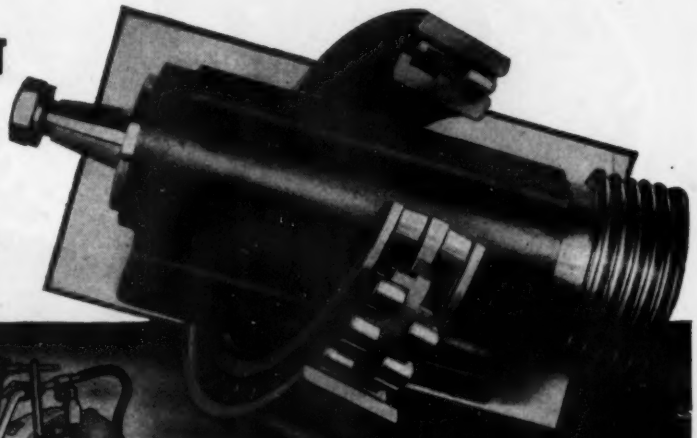

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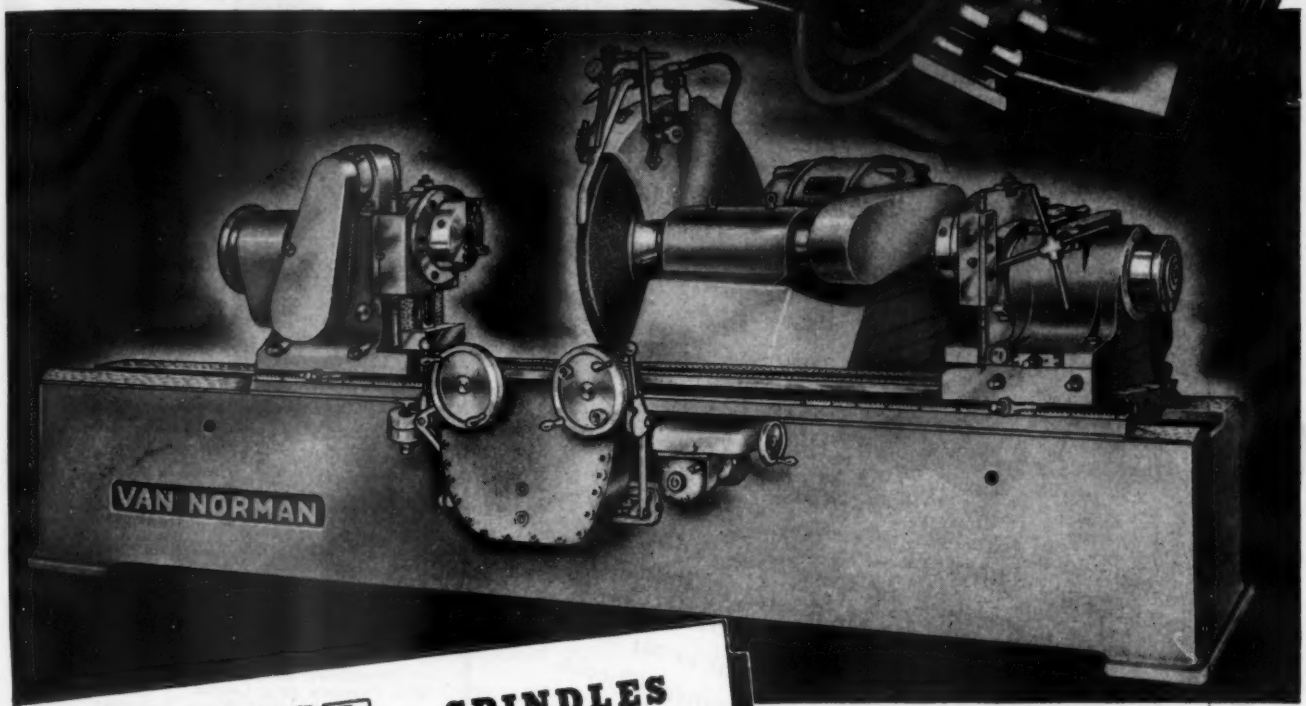

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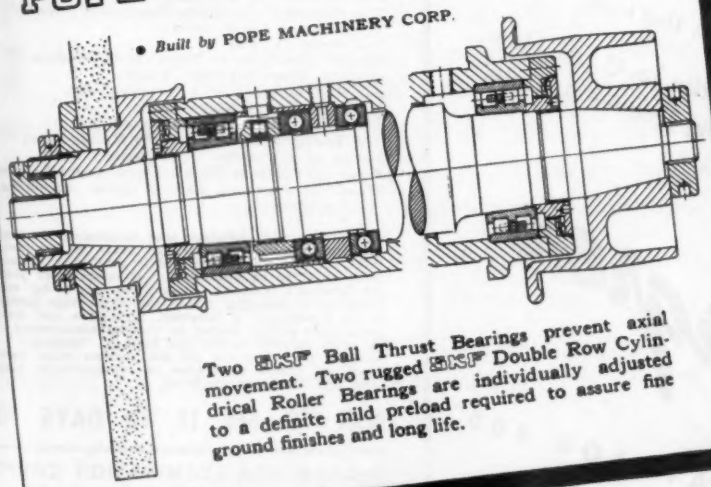

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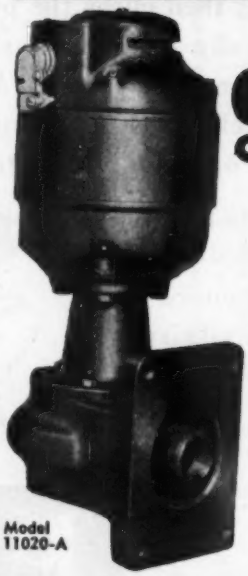

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Knurled "Unbrako" Socket Head Cap Screws are preferred by mechanics because the knurling affords a firm, non-skid grip for the fingers, handiest of wrenches. Lost time and wasted motion are eliminated and assembly thereby stepped up considerably. Knurling also permits locking in counter-bored holes, and *knurled* heads can be gripped by pliers for making minor adjustments in close quarters. Sizes: No. 4 to 1 ½" diameter. Full range of lengths.

Take advantage of the *extra* values offered by knurling next time you order — specify "Unbrako" Socket Cap Screws with *Knurled* Heads. Catalog gladly sent upon request.

Knurling of Socket Screws originated with "Unbrako" years ago.

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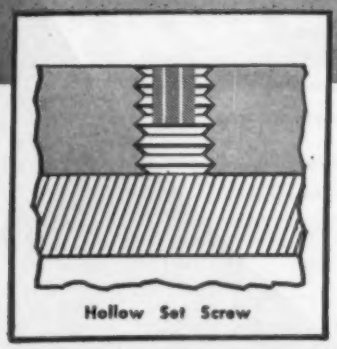


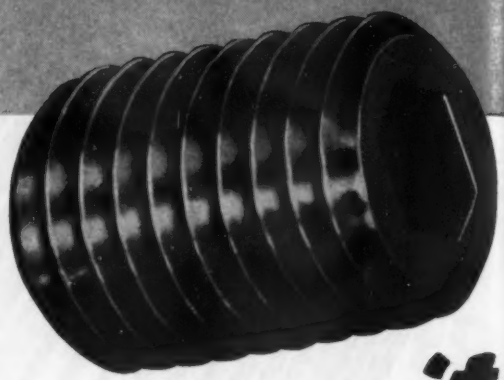
Hollow Set Screw

Hollow Lock Screw

The advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.

Mac-it Hollow Set Screws offer these design features, plus great strength. They are heat-treated to resist upsetting of the point, rounding out of the hex sockets, and splitting of sockets at the corners.

The tremendous holding power of Mac-it Hollow Set Screws makes locking devices unnecessary in all but a few applications. In these cases, Mac-it Hollow Lock Screws are used like jam nuts to prevent any possibility of loosening.



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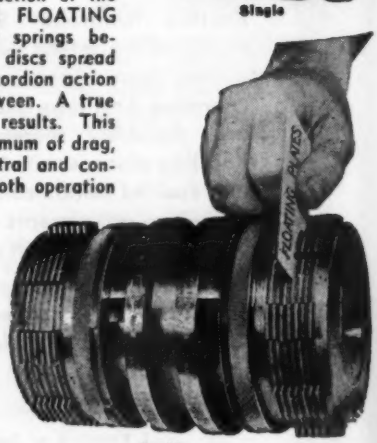

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Send for dimension sheets and specifications covering the sizes and types available.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 52 OR CONSULT SWEET'S OR THOMAS' REG.

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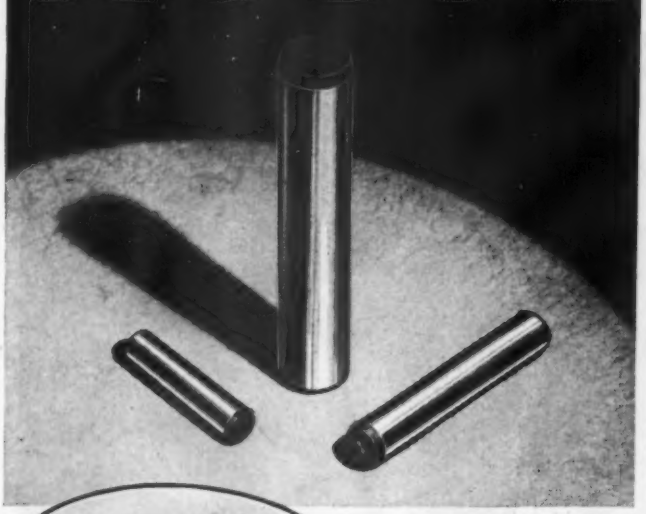

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Dowel Pins

What does *TRU-GROUND* signify in a Dowel Pin? In *precision* it means that the pin is ground to a limit of .0002" over basic size, with an allowable tolerance of plus or minus .0001".

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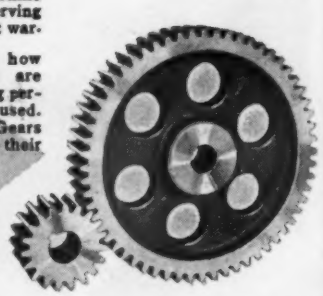

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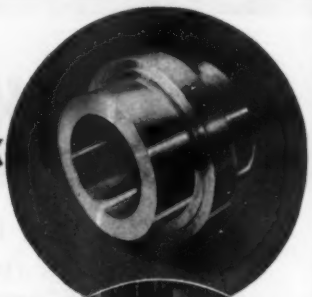
FROM A PERFECT BLANK INTO A *Perfect Gear!*



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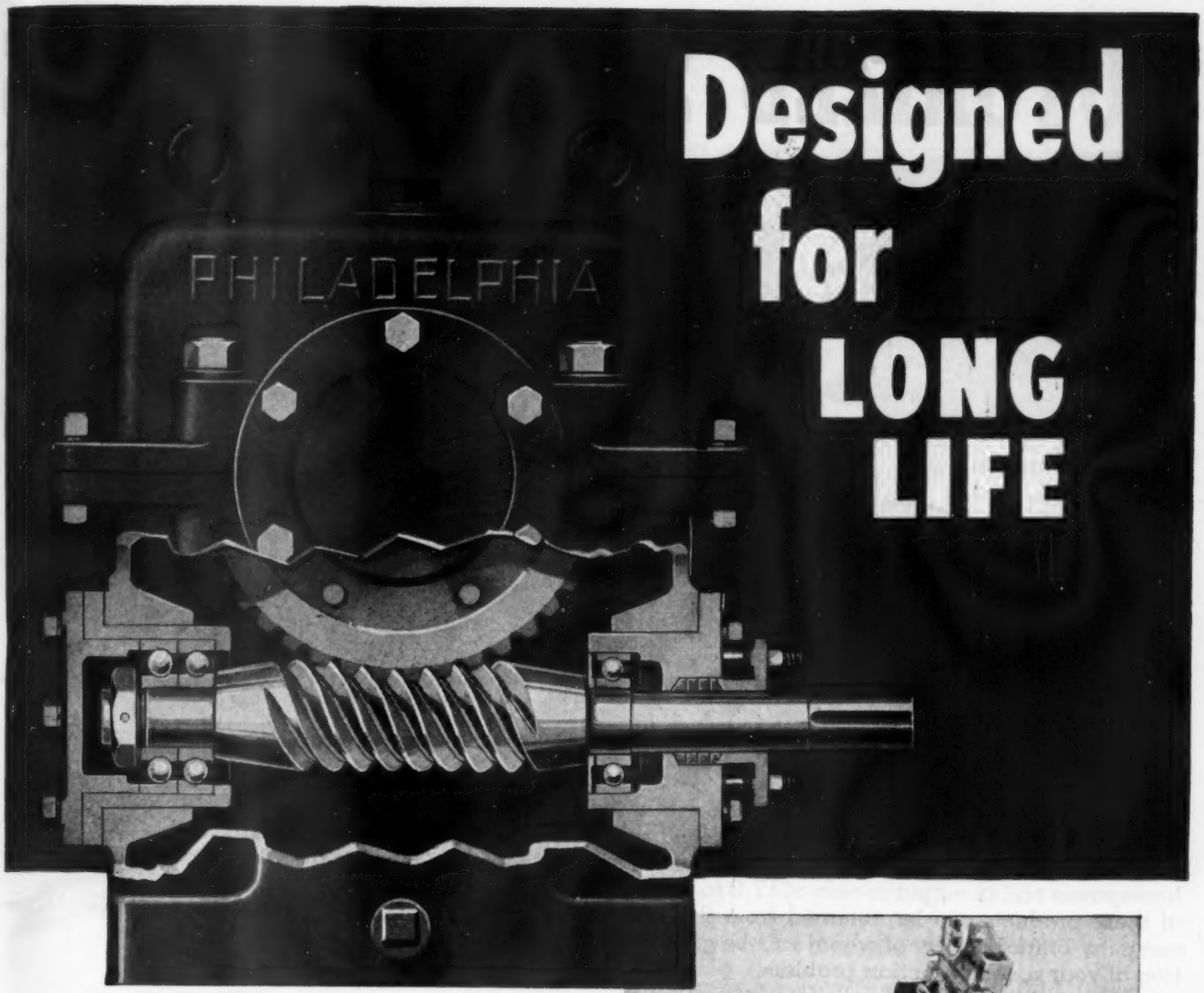

For a compact right angle drive that combines long life and trouble free operation get a Philadelphia Worm Gear Speed Reducer. In every way it will give service superior to open worm gearing which is exposed to dust and dirt, is poorly lubricated and subject to misalignment because of flimsy bearing supports.

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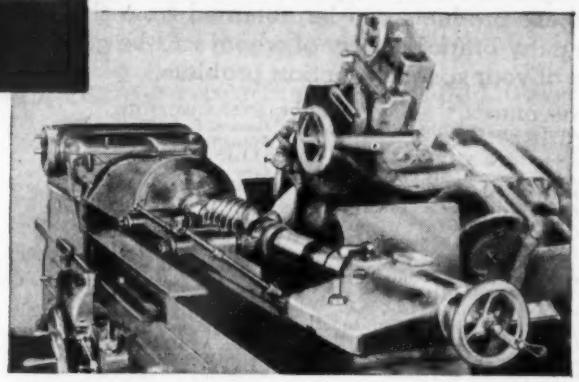

Philadelphia Worm Gear Reducers are made in both horizontal and vertical types. For complete description of sizes, standard ratios and information on selection of the proper worm gear drive for your job, write on your business letterhead for Catalog No. 25.

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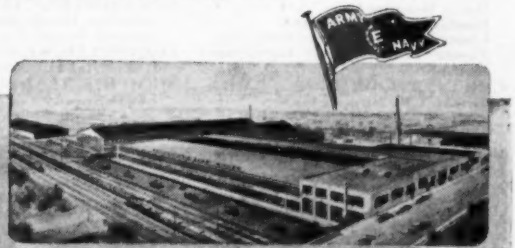
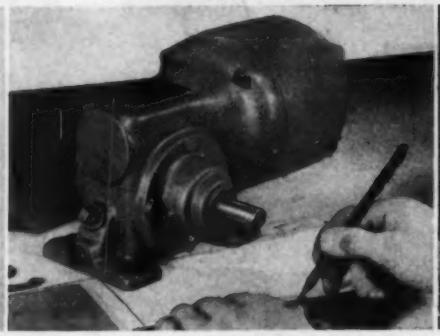


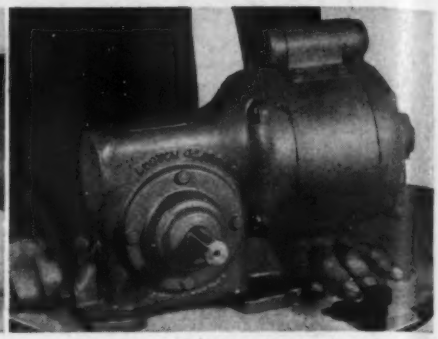
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

MOTORIZED SPEED REDUCERS

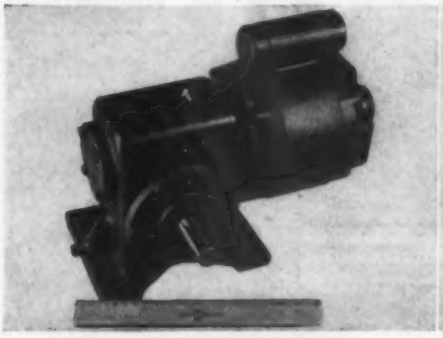
1/20 HORSEPOWER



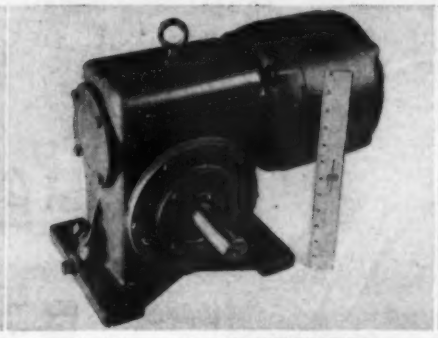
1/12 HORSEPOWER



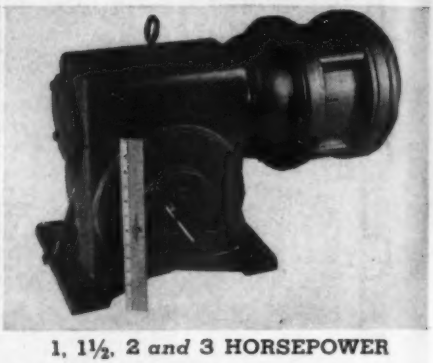
1/4 and 1/3 HORSEPOWER



1/2 and 3/4 HORSEPOWER



1/2, 3/4 and 1 HORSEPOWER



1, 1 1/2, 2 and 3 HORSEPOWER

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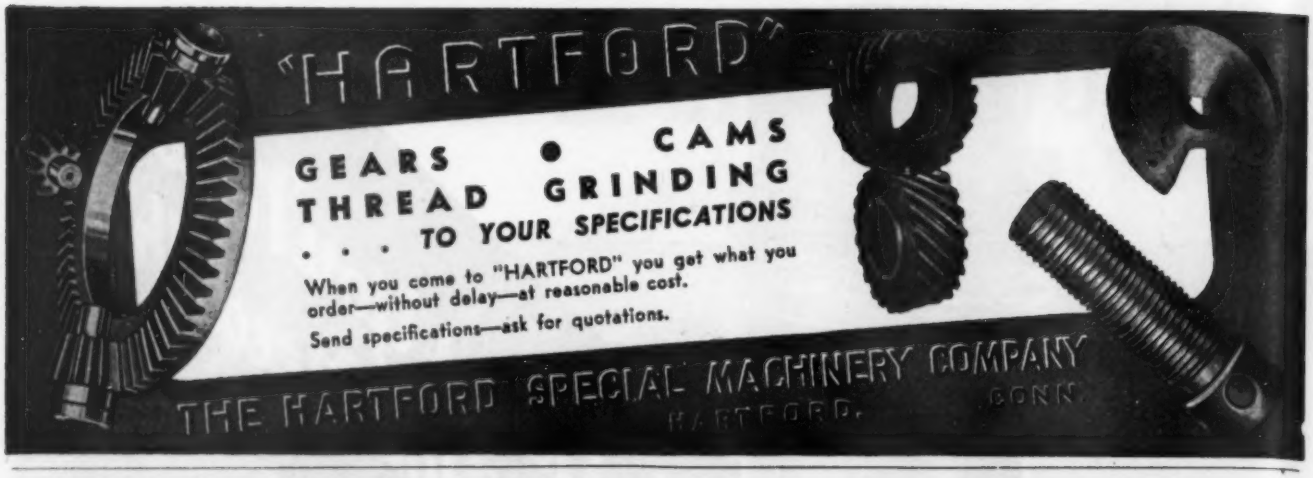
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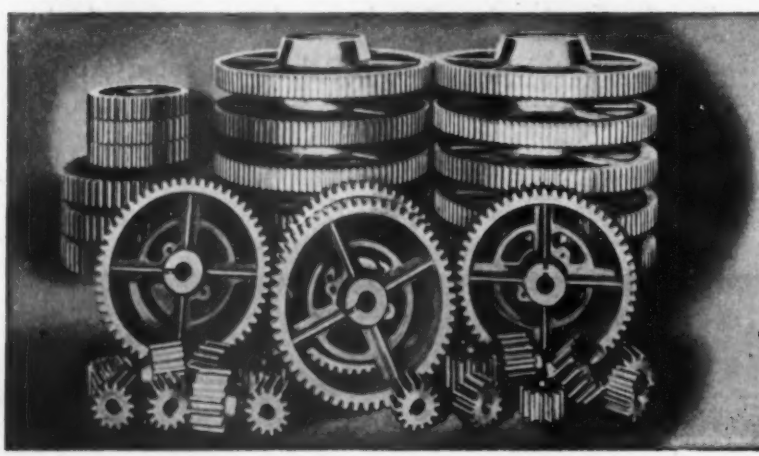

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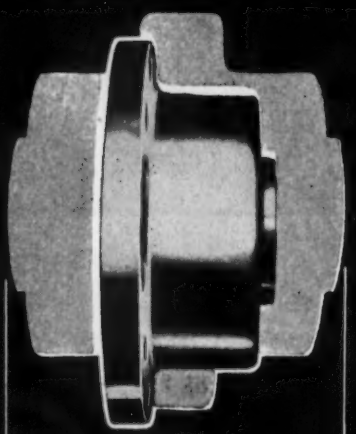

BULLETIN No. 446

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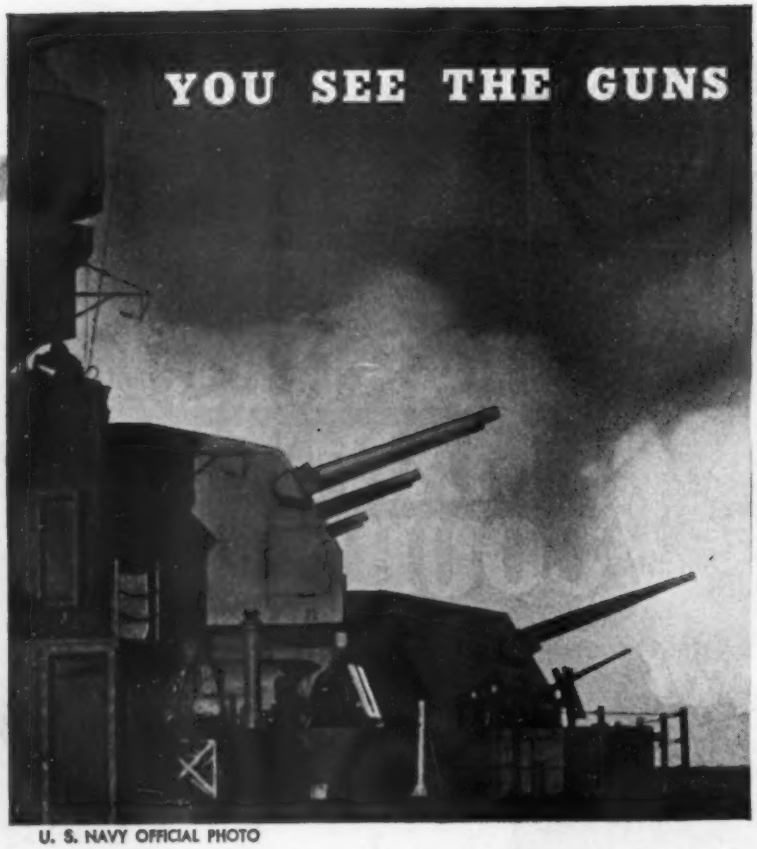

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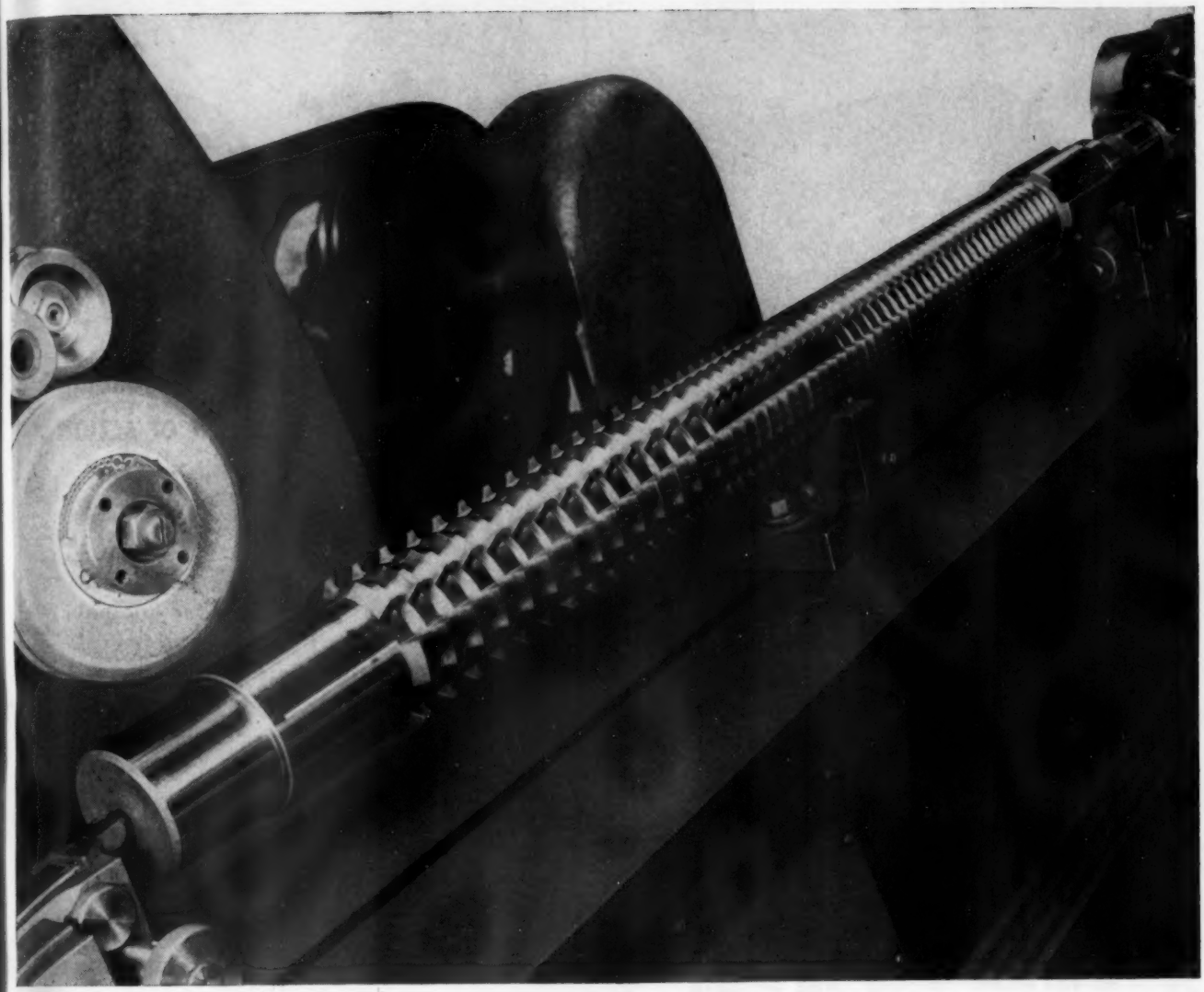

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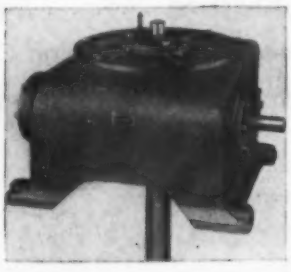
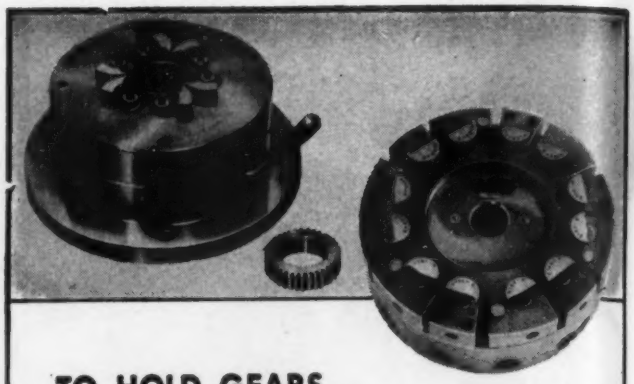
Old LST Number 385 has plowed into the beach to deliver essential war materiel to the doughboys that are fighting to hold the beachhead. . . . She's got her nose deep in the sand and must quickly back out for more "stuff" that'll help our G-I's in their battle with the enemy. . . . This back-out is easily done with the aid of a D.O. James 120 HV Worm Gear Reducer that is attached to the winch that pulls on the anchor—*"heave-ho my hearties and off she floats."* ★ Since 1888 we have been privileged with many opportunities of solving the power-saving problems of American industry . . . and now with such varied war time requirements the D.O. James line of Gear Speed Reducers of every type will prove an aid to you in the solution of your power-saving problems.



D.O. James Worm Gear Reducers are available in 26 sizes with a ratio range of 6 to 65:1 and from 1/32 to 150 horsepower. Either horizontal or vertical drive and in the Standard Reducer or Motorized.

D.O. James

ESTABLISHED 1888 MANUFACTURING CO.
1140 WEST MONROE STREET · CHICAGO 7, ILL.



TO HOLD GEARS
with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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BACK THE ATTACK
By Buying WAR BONDS

GANSCHOW GEARS
FOR SIXTY YEARS
Spur—SPEED REDUCERS—Worm
ALL TYPES OF CUT GEARS
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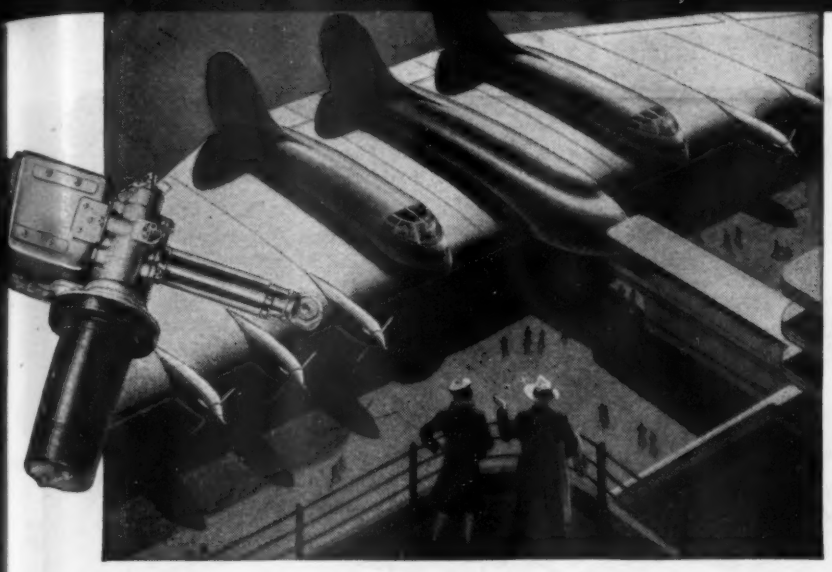
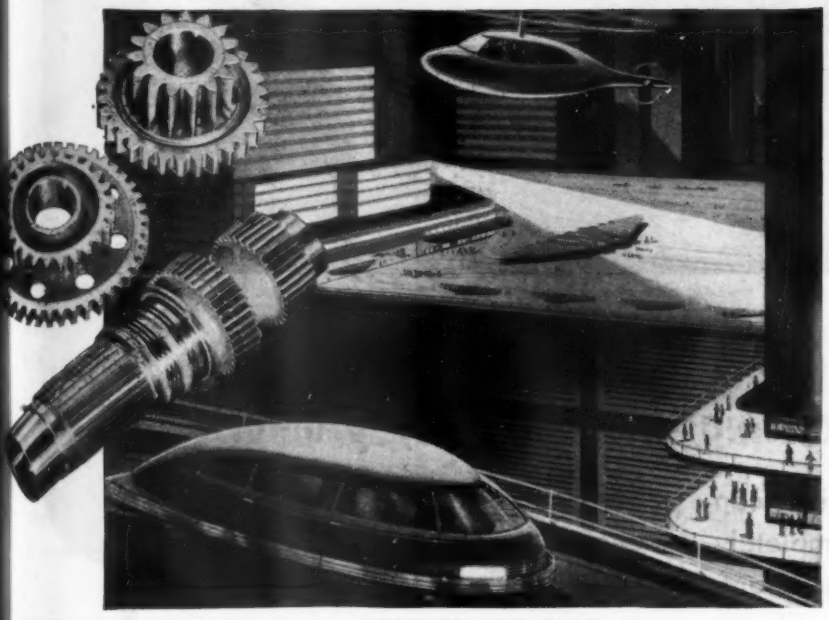
New Features
New Advantages
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*



These compact, efficient packages of power will perform many of the jobs in controlling the flight of tomorrow's skyliners. Their high precision has won them a place in today's fighter planes.

PROMISE OF A BRIGHT FUTURE

in the Transmission of Power...



Mass production of high precision gears will assure more efficient performance — greater compactness and increased speed in tomorrow's machines.

THE demands of war have brought a revolution in the economical transmission of power. Here at Foote Bros. new advances in engineering—new developments in the manufacture of extremely high precision gears, speed reducers and aircraft devices, give promise to American manufacturers of a new era of "better power transmission through better gears" when the war is won.

Tomorrow these new developments may solve problems for you in the equipment you manufacture. When that time comes, you may look to Foote Bros. for gears and speed reducers in any size—held to the tolerances you require. Foote Bros. will also be able to offer you an engineering service to assist your designers in any power transmission problem requiring the use of gears and speed reducers.

Improved speed reducer designs assure greater compactness—smoother operation and a new efficiency to tomorrow's equipment manufacturers.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 South Western Boulevard, Chicago 9, Ill.

FOOTE BROS.

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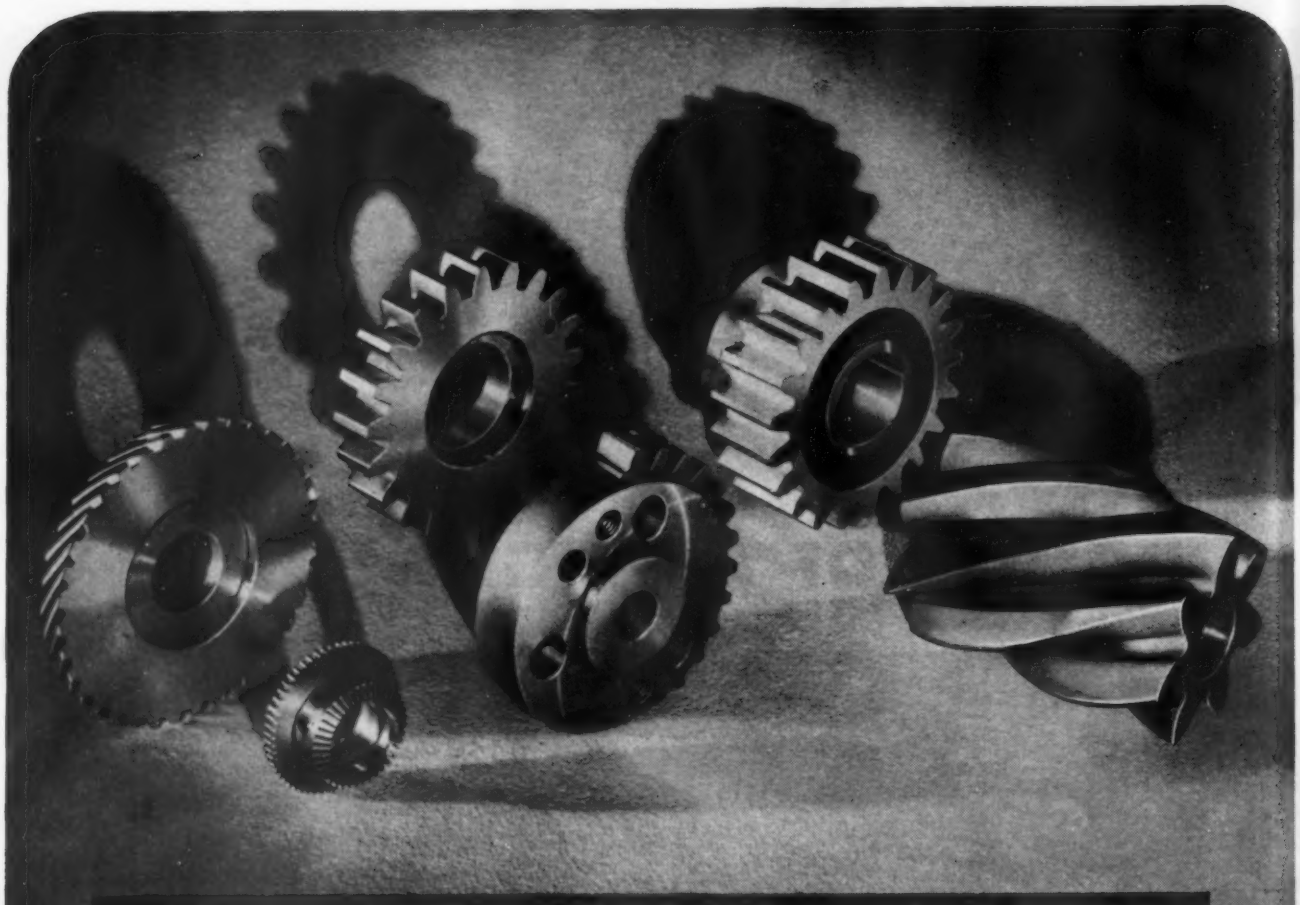

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Gears of all types and sizes can be cut in the modern, completely equipped Sier-Bath gear plant. Many years of specialized experience in gear production is behind every Sier-Bath precision gear. We are in position to handle work involving heat-treating and surface hardening. No gear is too difficult, no specification too exacting for Sier-Bath.

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The Doorway to 38 years experience in making Precision Gears

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but THEY'RE BEATING A PATH TO OUR DOOR

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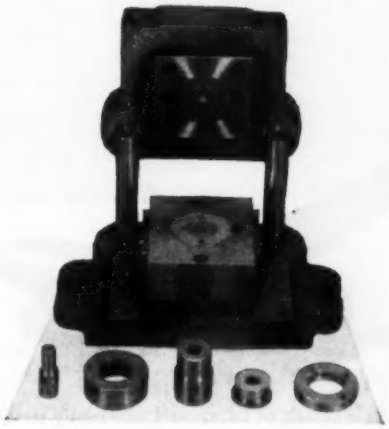
HOVIS METHOD OF MAKING WASHERS

WHETHER you build a better mousetrap or offer a vastly improved method of making washers, the result is the same: the world will demand your product. That's why HOVIS UNIVERSAL MASTER WASHER DIES are meeting with such a growing acceptance. It's no wonder when you consider that by simply investing in Master Washer Dies to fit your requirements and using 5 easily removable, interchangeable parts you can make any size washer, thus eliminating the necessity of making a new die for each size and type of washer.

When planning your postwar products, remember that a number of Hovis Master Washer Dies have been in continuous use for more than four years, and the Master Dies themselves do not become obsolete. A new set of interchangeable parts are all that you need for your new products.



Made in Four Sizes; ¾" — 1½" — 2½" — 4".

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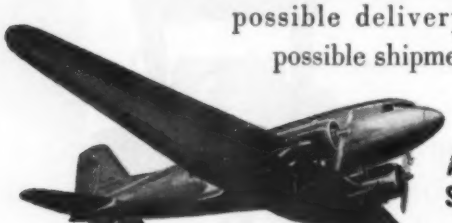

A Money-Saving, High-Speed Wartime Tool for Every Business

As a result of increased efficiency developed to meet wartime demands, rates have been reduced. Shippers nationwide are now saving an average of more than 10% on Air Express charges. And Air Express schedules are based on "hours", not days and weeks—with 3-mile-a-minute service direct to hundreds of U. S. cities and scores of foreign countries.

WRITE TODAY for "Vision Unlimited"—an informative booklet that will stimulate the thinking of every executive. Dept. PR-5, Railway Express Agency, 230 Park Ave., New York 17, N. Y.

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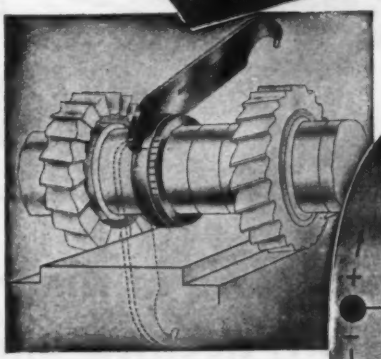
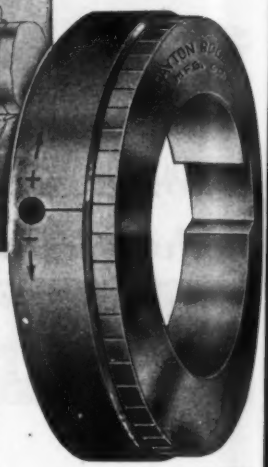
FAST, ACCURATE SPACING

for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

are made in 12 standard sizes for cutter arbors from 7/8" through 2"—other sizes on request.





You have plus or minus .0005" at your finger tips with Dayton Rogers Adjustable Spacing Collars. Graduated in thousandths, you can make an accurate and positive adjustment by simply loosening the cutter arbor nut and making necessary corrections as illustrated above.

Try them once and you will never run a gang or multiple milling job without them. Write today for full particulars.

DAYTON ROGERS MFG. CO. Minneapolis, Minn.

POWERFUL MACHINES ★ that use NO power

Famco exclusive adjustable gib assures perfect ram alignment.

★ Famco Arbor Presses deliver 1,000 pounds to 15 tons pressure ...without wires, motors, line shafts or power cost. With girl operators, they step up production on numerous time-consuming assembly and dismantling jobs. They make pressure operations easy... require low investment, small floor space, negligible upkeep cost. Famco Arbor Presses are ruggedly built...yet readily portable. Made in 32 stock sizes for bench and floor mounting.

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Famco Foot Presses, in 10 types, bench and floor models, are speeding up many light forming and stamping jobs.

Famco Squaring Shears, made in five sizes, cut up to 18 gauge mild steel. Powerful, easy to operate, sturdy and accurate.

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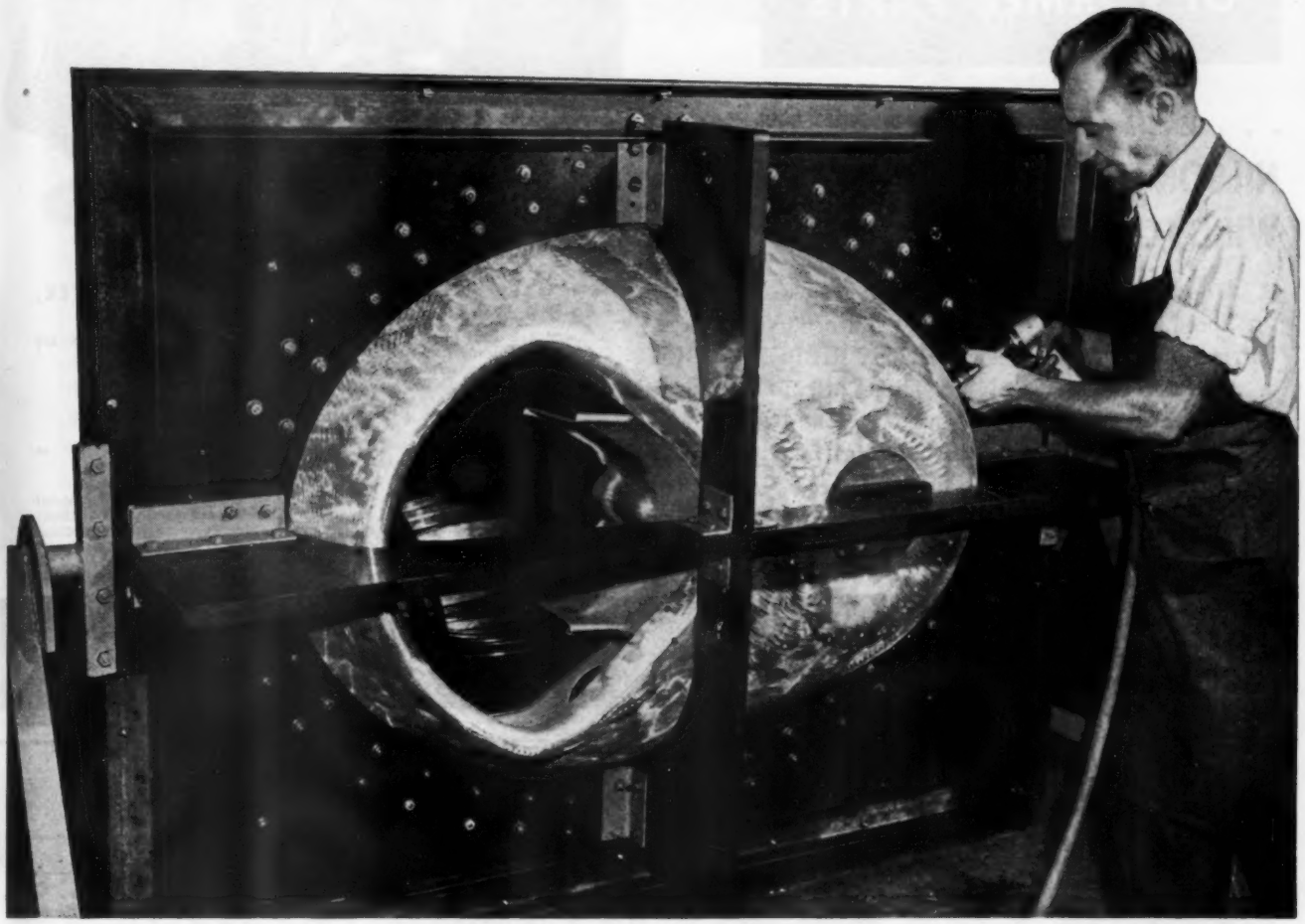
ARBOR PRESSES • FOOT PRESSES • SQUARING SHEARS

MORE MASONITE* DIE STOCK MEANS LESS WEIGHT, TIME AND COST



A great deal of Masonite Die Stock is used in this jig for assembling the nose cowl of a plane at Fairchild Aircraft, Division of Fairchild Engine & Airplane Corporation.

WHEN you use Masonite Die Stock in assembly fixtures, you win three different ways. You save *weight—time—costs.*

This amazing semi-plastic material is only one-sixth the weight of steel. Yet it acts like metal in that it helps solve problems relating to dimensional stability, rigidity, torque and deflection.

You save time and money with Masonite Die Stock because this material, thickness for thickness, is a fraction of the cost of metals—because of the speed with which it can be worked with either metal-cutting tools or with high-speed pattern shop equipment.

Today, you find this modern die stock widely used in aircraft plants throughout the country. And it has also become a prime favorite of other fabricators of thin-gauge metals who want to do a *faster, better job at less cost.*

Masonite Die Stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. Whether you want to reduce the size of steel members in assembly fixtures—or whether you are concerned with some of the other uses of Masonite Die Stock—get acquainted with this remarkable material at once. Simply fill out and mail the coupon.

*TRADE-MARK REG. U. S. PAT. OFF. COPYRIGHT 1944, MASONITE CORP.

Awarded to the Masonite Corp. plant at Laurel, Miss.

MASONITE CORPORATION *Dept. AM-5, 111 W. Washington St., Chicago 2, Illinois*

Please send me illustrative literature and complete information about Masonite Die Stock.

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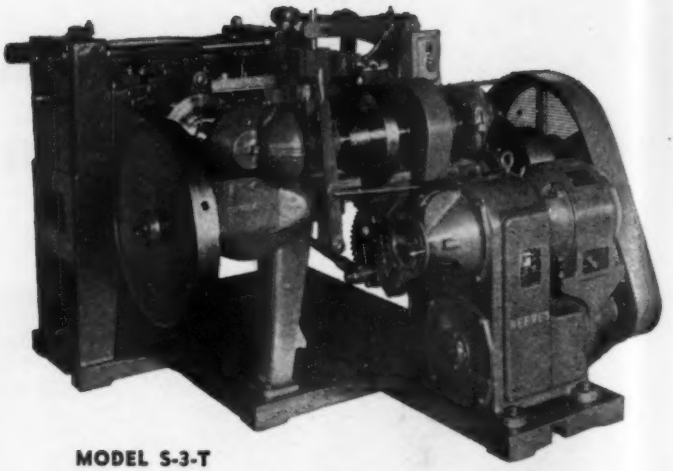
STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.



MODEL S-3-T

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

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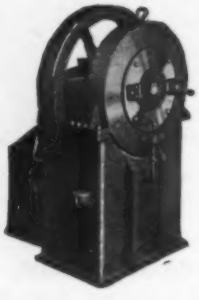
We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO. . . . *Bridgeport, Conn., U.S.A.*



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TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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STANDARDIZED DIE SETS

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DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

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Machined Steel Semi-Steel
Send for our new catalog
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AUTOMATIC EQUIPMENT
THE V&O Press Co.
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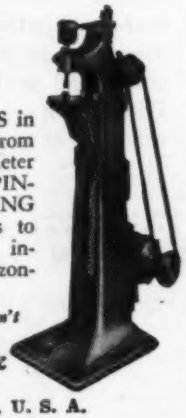
RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



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PRECISION DIE SETS
DANLY MACHINE SPECIALTIES, INC.
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THEIR PRECISION
Means Greater Accuracy In Your Production
Danly Commercial Sets
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SINCE 1916 KRW A MARK OF DEPENDABILITY

SPEED

SPIN THE HANDWHEEL and the ram speeds to the work by fast mechanical action instead of slow, laborious hydraulic pumping.

FLIP THE BALL ARM to close the valve instead of slowly turning a handwheel type control.

START PUMPING and immediately get tons of pressure on the work because the hydraulic cylinder was automatically filled with oil during oper. No. 1.

3 QUICK MOTIONS OPERATE KRW HYDRAULIC PRESSES!

SPEED is the basic design feature of KRW Hydraulic Arbor Presses—*they are faster than most power-operated presses.* In operation, you get *speed* in bringing the ram to the work ... *speed* in developing hydraulic pressure... *speed* in raising the ram to remove the work. These KRW features have sold thousands of our hydraulic presses to industry where they are doing work formerly considered only possible on larger, heavier and more costly equipment. Ingenious adaptations of KRW presses have been built to handle many kinds, sizes and types of material. All, of course, incorporate the KRW principle of SPEED in operation. Write for our new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacities.

IMMEDIATE DELIVERY
on AA-4 Priority or better

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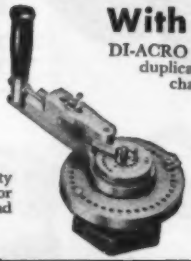
10 LOCK ST., BUFFALO 2, N. Y.

Precision CENTERED EYE Bending

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

DI-ACRO Bender No. 1
Forming radius 2" approx. Capacity 3/8" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3, with larger capacities.



With DI-ACRO Benders

DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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"Ask ETNA about Swaging"

• If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of 1/8" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

The ETNA MACHINE Co.
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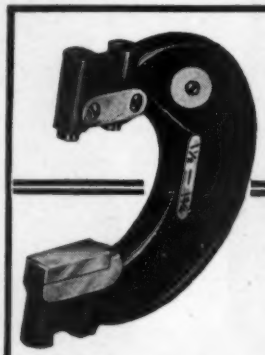

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ADJUSTABLE LIMIT SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N.Y.

Precision Grinding—Faster—Smoother

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GRINDING OILS and LUBRICANTS for PRECISION GRINDING

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Economy Grinding Lubricants (Water Soluble)	20-35
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★

Greater speed with precision grinding by ECONOMY oils and lubricants. New performance records are described and photographically illustrated in this new book which is yours for the asking.

The subject of oil grinding and water soluble grinding lubricants is explained in detail and other useful information given in its pages.

Write us about your grinding problems, types of machines operated, nature of work performed, and kinds of materials ground, so we may send you recommendation for the oil or lubricant which experience has proved to be best and most economical for your particular work.

Send today for your free copy of this handbook — 1944 F-18- on grinding oils and lubricants. Please use your company letterhead.

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WORCESTER, MASS., Chicago, Detroit, Minneapolis

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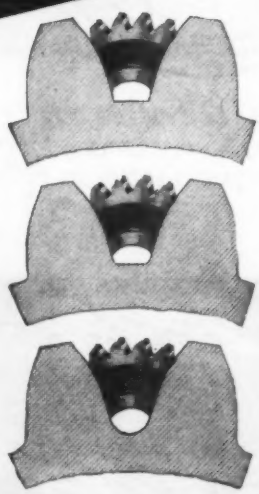

DEFINITE CONTROL OF ROOTS

GEARGRIND formed wheel trimmers and wheel trueing devices insure whatever root profiles your design calls for —straight roots or definite radius fillets as well as full radius roots giving absolute line continuity for carrying maximum loads.

The GEARGRIND method of Formed Wheel Grinding is demanded by many leading engineers because it insures volume production of finely finished, highly accurate parts that require a negligible amount of reworking.

Investigate GEARGRIND Machines at once, if your program calls for accuracy, fine finish and speed in the production of external and internal gears, external and internal involute splines, straight splines, serrations and racks.

Standard requirements are fully met by standard GEARGRIND Machines, but if you have a tough job requiring a special machine, we are in position to design and build it for you. Full information is given in our general catalog.

The GEAR GRINDING MACHINE COMPANY

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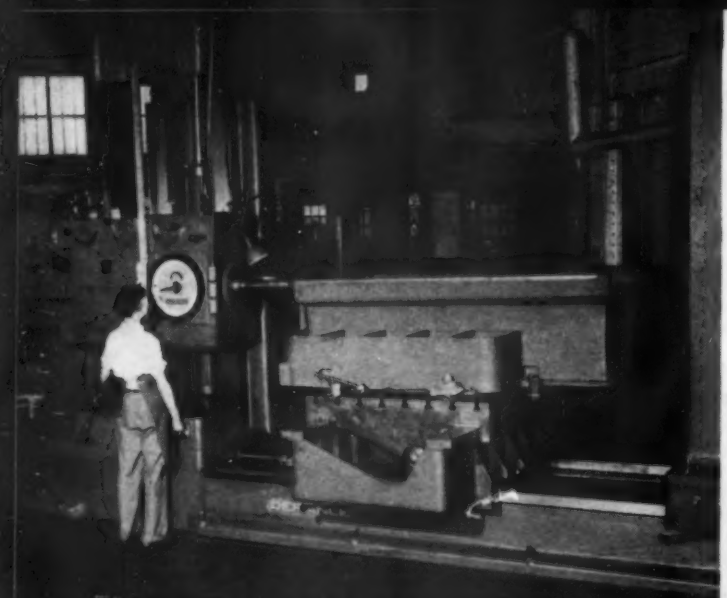
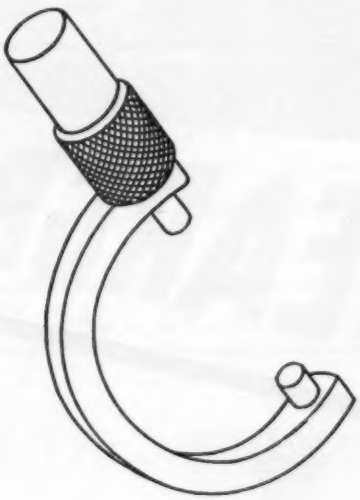


One of 14 Defiance Horizontal Boring Mills in operation at our plant

DEFIANCE

stands for accuracy



An example of multiple planing

Grinding table top

Expert heat-treating adds life to machinery

THE plant contains a wide variety of fine machine tools which are frequently checked and maintained at high accuracy.

The attention given to every detail by experienced operators, the frequent checking and testing as the machine progresses toward completion, the interest and carefulness of our assembly crew assure Defiance machines of being accurate.

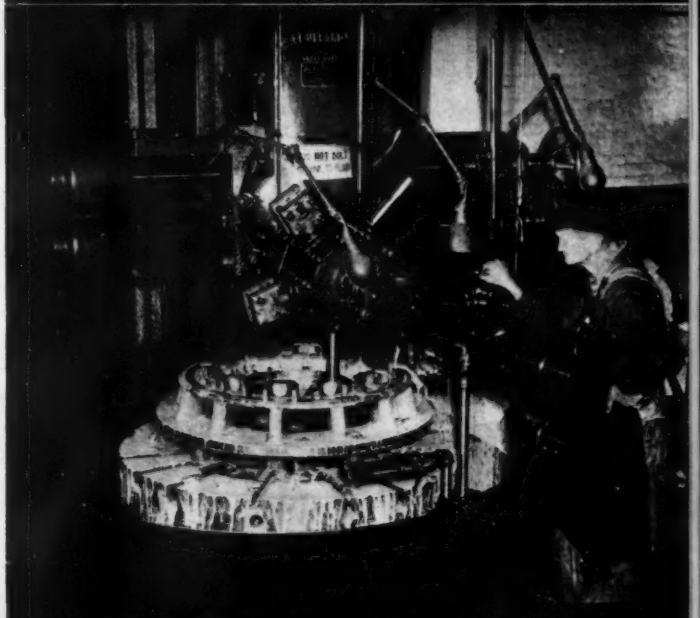
Building precision machines for long hard wear is our business and the superior skill of Defiance mechanics is built into every Defiance machine.

In every section of the shop you will see the sign, "Defiance Stands for Accuracy." This is our slogan. This is also our pledge—to ourselves and to our customers . . . Defiance Machine Works, Inc., Defiance, Ohio.

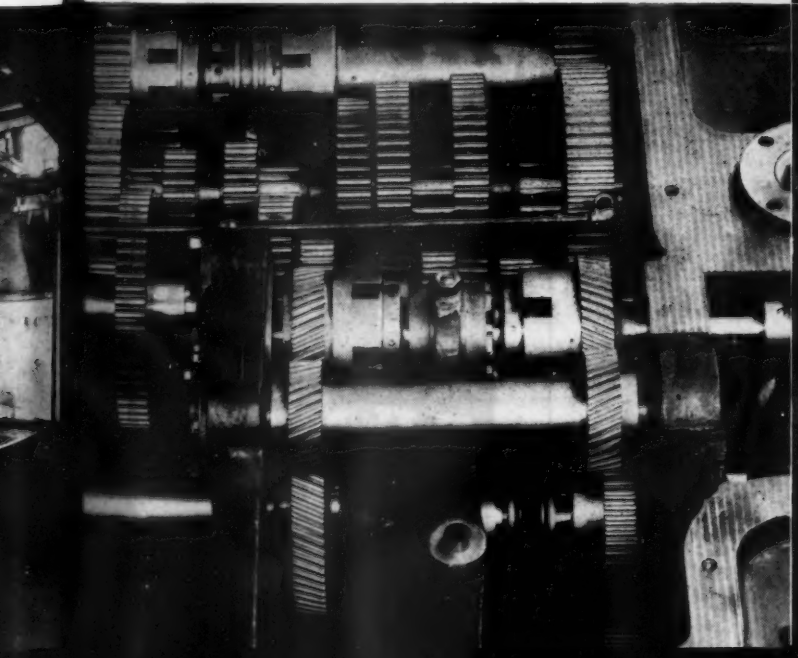
DEFIANCE

HORIZONTAL BORING MILLS . . . AND A COMPLETE LINE OF DRILLING EQUIPMENT

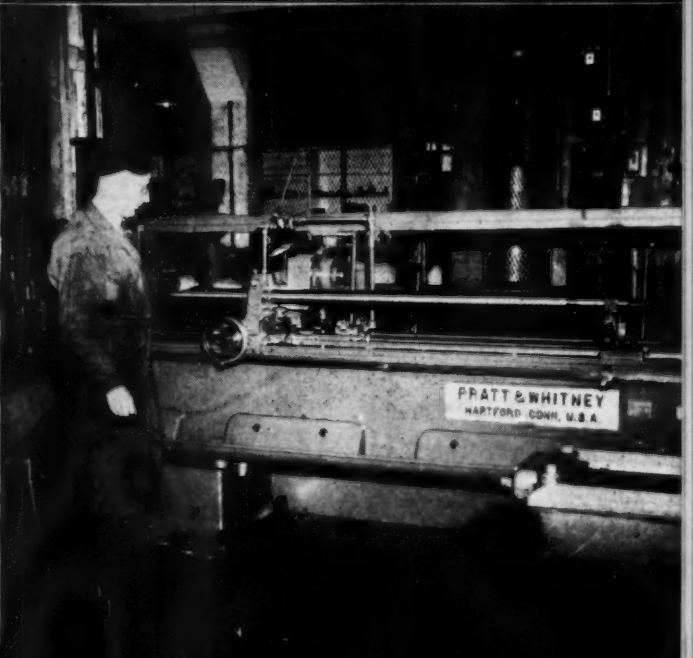
Milling a spline shaft



A difficult stainless steel job



Typical example of careful assembly



Lead screws must be right

NO RE-TIGHTENING NECESSARY

Boots Nuts Show How To Cut Maintenance

William Reid, Purch. Agt., METROPOLITAN DISTRIBUTORS, INC., New York City, says, about an 8 months test of Boots Self-Locking Nuts: "They were used on drive shafts and spring clips, and during our periodic checks were found to hold firm, consequently requiring no tightening. Operating approximately 1800 vehicles, we are naturally interested in anything that might reduce our maintenance costs and improve our efficiency."

One of the 1800 vehicles operated by Metropolitan Distributors, Inc. Boots Nuts were tested on trucks like this.

WHEREVER vibration loosens ordinary fastenings, Boots Nuts hold firm and safe. That's why, after the war, they will do away with the need for periodic tightening jobs on spring clips, body bolts, clutch pedals, universal joints, brakes, axle supports, wheel nuts and similar points . . . That's how they will minimize maintenance costs.

Since Boots Self-Locking Nuts are one-piece, all-metal, they are not affected by the corrosive action of oil, water and chemicals. Another advantage—they can be used again and again without accelerated locking loss of other self-locking nuts.

Boots Nuts Will Prevent This

This broken spring, costing $25.00 to replace, might have been prevented had nuts on spring clips stayed tight.

BOOTS SELF-LOCKING NUTS

"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

MOVING?

If you plan to change the address to which your copies of AMERICAN MACHINIST are sent, let us know now. We don't — and we're sure you don't — want a single issue to be delayed in reaching you. Coupon below is for your convenience.

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Name .....

Title .....

Company .....

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Company .....

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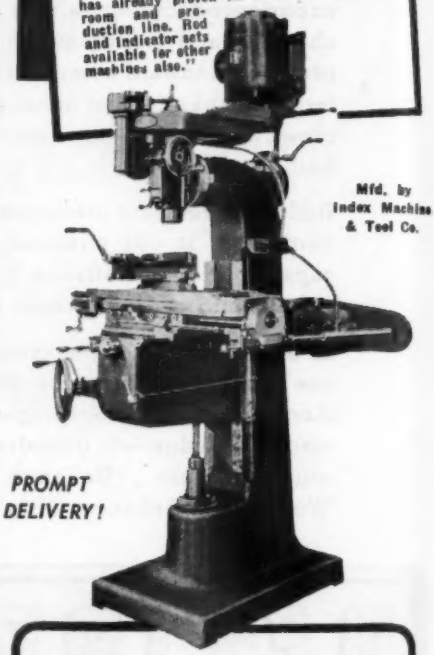
NOW! INDEX MILLS EQUIPPED WITH RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods cross and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and indicator sets available for other machines also."



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

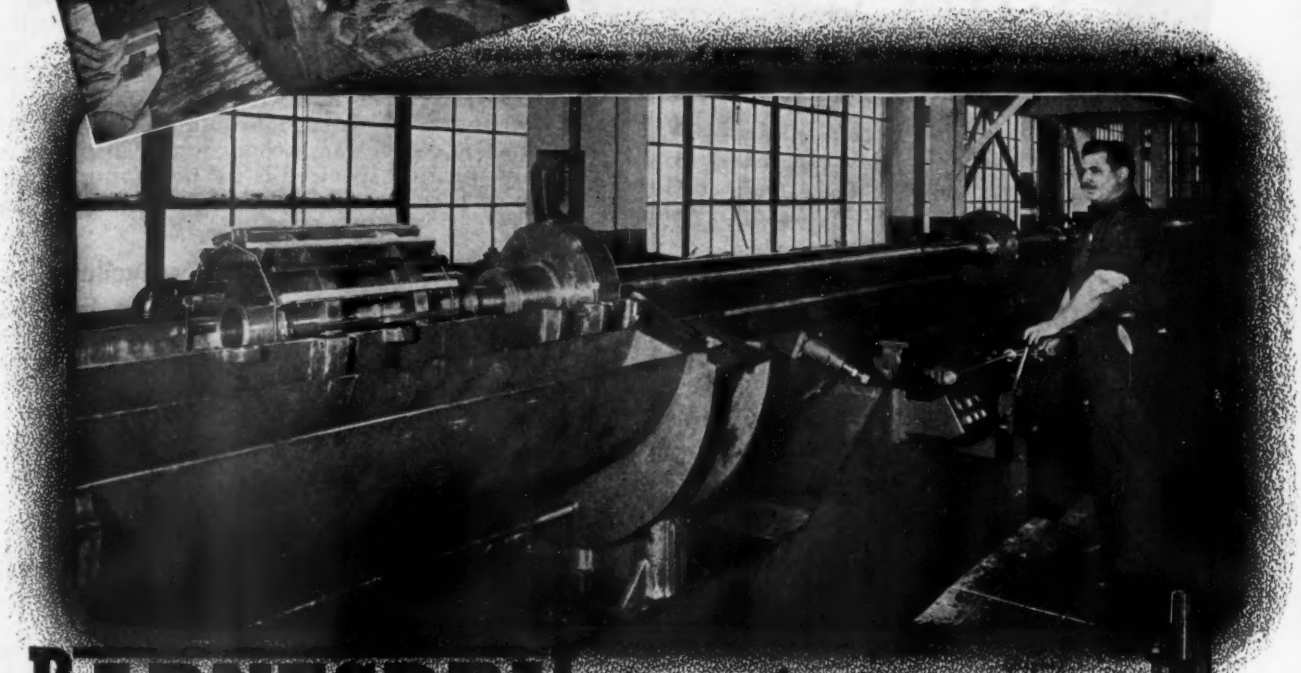
For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

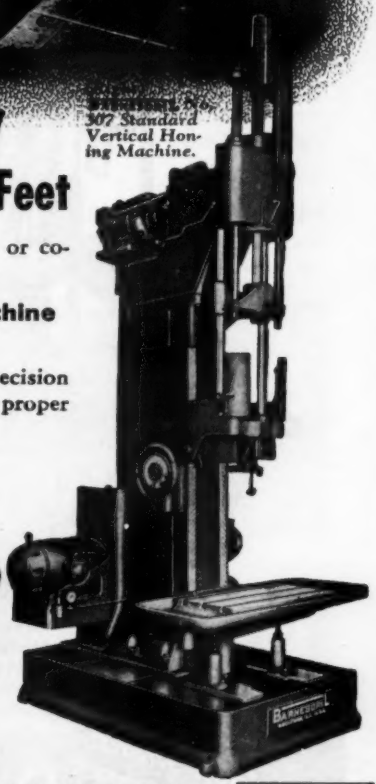
3100 E. MICHIGAN AVE.
JACKSON, MICH.

(Below) BARNESDRIL No. 30 Horizontal Honing Machine for honing large diameter bores.

Honing a 17½" Diameter by 20 Ft. Long Bore with .030" to .040" Stock Removal . . .



BARNESDRIL Honers for Any Bore up to 42" Diameter and Lengths to 75 Feet



No. 307 Standard Vertical Honing Machine.

These large chrome molybdenum alloy forging cylinders, 17½" in diameter and 20 feet long, are honed on a No. 30 BARNESDRIL Horizontal Honing Machine with a 50-foot working stroke. The honing operation produces a mirror finish with the removal of only .030" to .040" of stock. This manufacturer also uses this machine for honing larger cylinders by adapting a 41½" hone on the same machine.

Honing is Adaptable to Any Bore

To meet any of your finishing requirements, BARNESDRIL Honers are made in a wide range of sizes to handle work up to 42" in diameter and lengths to 75 feet or longer. These BARNESDRIL Honing Machines are made in vertical, horizontal, and angular types, with one or more spindles. External surfaces can also be finished with excellent results by conventional or co-directional honing.

How to Select the Proper Machine for Your Job

Let BARNESDRIL Engineers, experts in precision finishing methods, help you select the proper type and model of honing machine for your specific production requirements. Just send blueprints of parts for analysis and recommendations. There is no obligation.

FREE HONING DATA

Here is a valuable booklet with complete details of the Honing Process and the complete line of BARNESDRIL Honing Machines. Write for free copy —Bulletin No. A-121.

Barnes Drill Co.

830 CHESTNUT STREET
ROCKFORD
ILLINOIS, U. S. A.

THE Roto-Matic* PRINCIPLE...

WHAT IT MEANS... AND HOW TO APPLY IT FOR INCREASED PRODUCTION....

Roto-Matic means..."Continuous Operation"

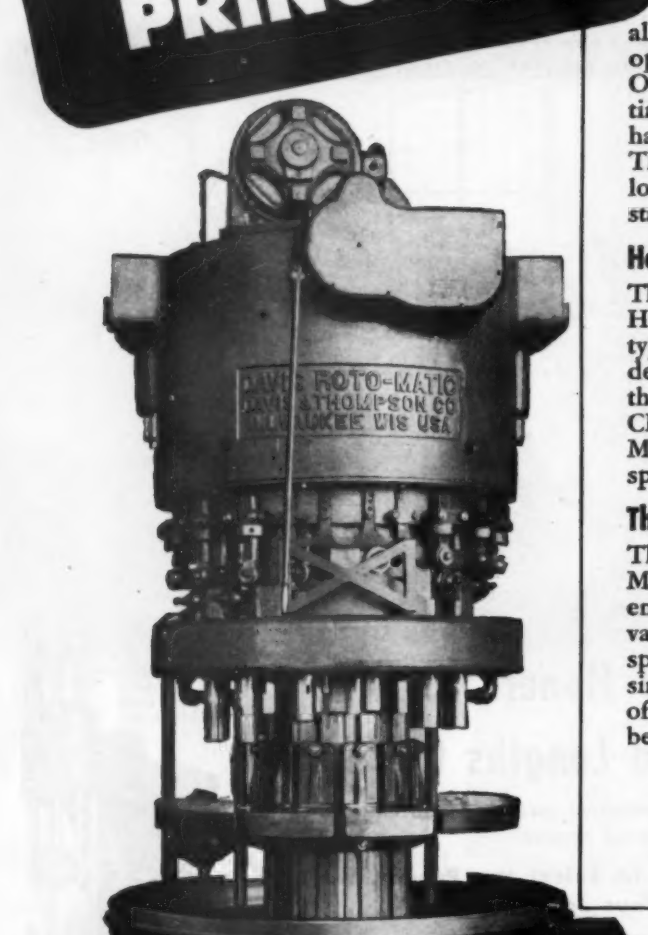
The Roto-Matic principle is the time saving principle of continuous operation. On Roto-Matic Drilling Machines, work and spindles alike rotate continuously about a column with the operation being performed as they rotate. NO STOPS OR SLOW-DOWNS ARE REQUIRED. From the time the Roto-Matic is set into motion until the job has been completely run, production is in progress. The only attention required is for unloading and reloading as each completed part passes the loading station.

Horizontal and Vertical Roto-Matics Available...

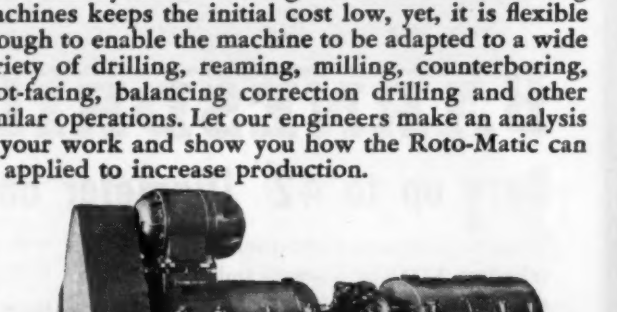
The Roto-Matic principle is applied to both our Horizontal and Vertical Drilling Machines. The best type to use for any particular drilling operation is dependent upon the size and shape of the part and the nature of the operation itself. NEITHER MACHINE IS OF THE INDEXING TYPE. The Roto-Matic can be furnished with either single or multiple spindle heads.

The Roto-Matic Performs Numerous Operations

The basically standard design of Roto-Matic Drilling Machines keeps the initial cost low, yet, it is flexible enough to enable the machine to be adapted to a wide variety of drilling, reaming, milling, counterboring, spot-facing, balancing correction drilling and other similar operations. Let our engineers make an analysis of your work and show you how the Roto-Matic can be applied to increase production.



(Above) The Vertical Roto-Matic Drilling Machine. Fixture and tooling are the only special engineering required to adapt it to an endless variety of work.



(Above) The Horizontal Roto-Matic Drilling Machine. Can be furnished with single or multiple spindle heads.

Free Booklet For additional information on Roto-Matic Drilling Machines, write for Booklet No. AM5-44

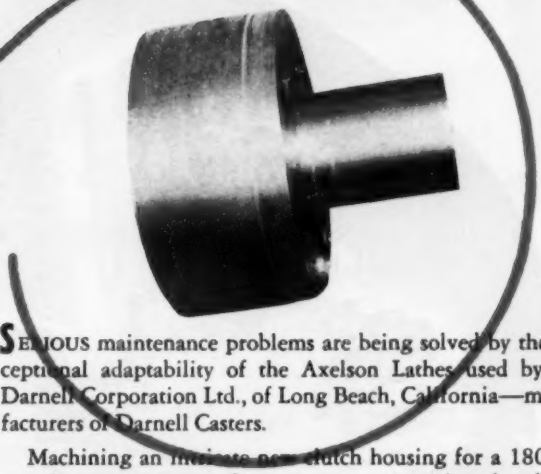
DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company

Manufacturers of Machine Tools and Micrometers

MILWAUKEE 14, WISCONSIN

AXELSON LATHE *adaptability*
solves problems for Darnell Corporation



SERIOUS maintenance problems are being solved by the exceptional adaptability of the Axelson Lathes used by the Darnell Corporation Ltd., of Long Beach, California—manufacturers of Darnell Casters.

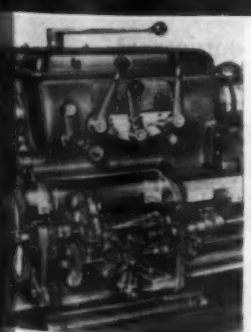
Machining an intricate new clutch housing for a 180 ton punch press was one of many recent unusual undertakings by this company—made possible by the simplicity with which any type of precision work can be accomplished on Axelson Lathes.

Precision is the keynote in the manufacture of Axelson Lathes, and extra care is given to assure built-in quality in every detail. All gears are machined to give exact precision—transmitting leads and threads accurately from headstock to cutting tool. Exceptionally sturdy spindle, correctly mounted on pre-loaded precision bearings, is designed to eliminate camming action and to run true under heavy service. Control levers are conveniently located for easy operation, and index plates show lever settings for any desired feed, lead or thread.

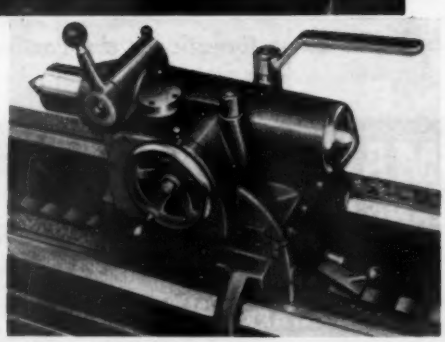
Every step of production and assembly is controlled by Axelson engineers, and every part is manufactured in our own shop by the most modern methods and equipment. That is why Axelson Lathes are proving reliable for an ever growing list of users the world over.

AXELSON MANUFACTURING COMPANY
6161 S. Boyle Ave., (Box 98 Vernon Station) Los Angeles 11, Calif.
50 Church St., New York City 7 • 3844 Walsh St., St. Louis 16, Mo.

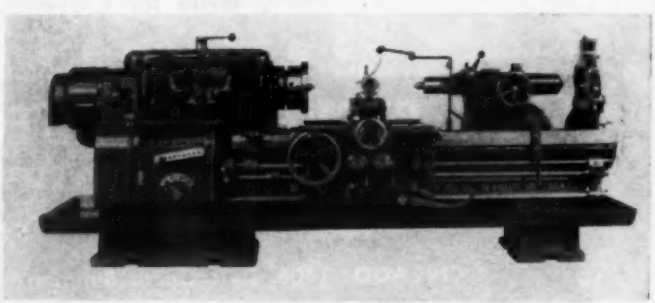
AXELSON LATHES
Dependable for over a Quarter Century



perated headstock shift levers 24 spindle speeds to give max- efficiency under any working on. Hardened and ground al- steel gears are engineered for engagement and long wear severe service. Mounted on anti-friction bearings.



The 2-Speed Tailstock is an exclusive, patented feature which gives users of Axelson Lathes an important advantage. The added selection of speed and power makes Axelson one of the most versatile of all lathes.



Axelson Heavy Duty Lathes are made in 14, 16, 18, 20, 25 and 32-inch sizes, in various lengths. Skilled Axelson engineers, backed by 30 years experience, control every step of manufacture from drawing board, through foundry, to precision machining of each part and final assembly.

There's A 3¾" CLEVELAND Too

Remember— CLEVELANDS CUT COSTS!

• Just one of the versatile Cleveland family. The only complete line of full automatic machines with bar stock capacities from 9/16" to 10"...

PLUS Cleveland-made high pressure hydraulic die-casting machines for magnesium, aluminum, bronze, brass or zinc.

Write for Cleveland bulletins on automatic or die-casting equipment.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND 3, OHIO

SALES OFFICES

CHICAGO: 1408 Civic Opera Building
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Building
CINCINNATI: 1315 American Building

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"

May be purchased on M.R.O. priority.

A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

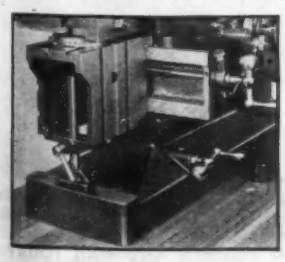
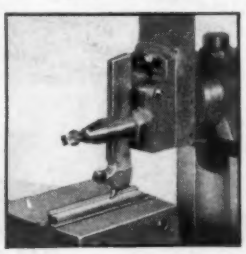
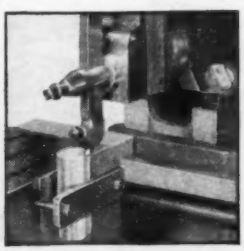
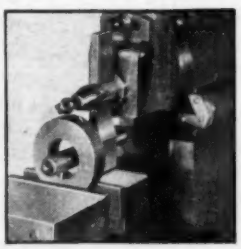
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

Available for stationary installation or as portable unit ...Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job ...Just plug in to an electrical outlet, and go to work. Saves steps and time.

★

Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable

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ARMY E NAVY

AMMCO 2100 COMMONWEALTH AVENUE NORTH CHICAGO, ILLINOIS

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

Automatic Rotation PROFILING

* WORK and MASTER **ROTATE** with TABLE MOVEMENT

CYLINDRICAL Interrupter Cam for Gun-Fire Control

A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

Blank cylinders come to the Gorton Duplicator, finish-turned. The 10 wells are first rough milled to a depth of .052". Then a finish cut, with the same cutter and spindle speed, removes .010" stock, merely by lowering spindle the required amount. Hand finishing required is almost negligible—due to the excellent finish obtained by the use of 2-flute Tungsten Carbide form cutters—at Gorton high spindle speeds.

PRODUCTION DATA

Material—S.A.E. 1020 Seamless Steel Tubing.
Operation—Rough and Finish Milling of 10 Wells (varying from 3/4" wide x 3/8" long . . . to 3 5/8" wide x 2" long), .062" deep.
Cylinders—9 9/16" O.D. x 7 25/32" long.
Feed—Manual . . . Spindle Speed—4,000 r.p.m.
Tolerances—±.005".
Time—Roughing 18 minutes; finishing 23 minutes; total floor-to-floor, 43 minutes. (10 wells complete, average 4.3 min. per well.)

ENGINEERING SERVICE . . . FREE

Have the advantage of 50 years of Gorton Specialized Tracer Control Experience in your shop—call nearest Gorton dealer or write to Gorton factory at Racine, Wisconsin.

The Right Size The Right Type of Machine for Every Job.

From 2 oz. to 2 ton

DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON'S ARMY E NAVY

GORTON Precision MACHINES

CUTTER GRINDERS · STICKING MACHINES · 2 & 3 Dimensional PANTOGRAPHS · Vertical & Universal Head Super-Speed MILLERS · Manual & Electric Control DUPLICATORS

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George Gorton Machine Co.,
1505-13 Racine St., Racine, Wis.
Send me these free books

- ☐ Condensed Catalog
- ☐ Die and Mold Duplicators

Name..... Title.....

Company.....

Address.....

City..... State.....

50 YEARS IN THE MAKING

and Built for Tomorrow!

In action in a well known plant producing engines for the war effort, a Baush Multiple-Spindle Machine is shown reaming holes in a cylinder block casting. This machine, like the many other Baush Machines doing war duty in plants all over the nation, embodies the accumulated knowledge gained by Baush engineers in fifty years of pioneering in the design and manufacture of high-production tools for drilling, boring, tapping, reaming and similar operations.

That half-century's constant experiment and perfecting are your guarantee of a machine that not only delivers efficient performance on today's heavy production schedules . . . but that will continue to give years of profitable service in the peace to come!

Write today for full data on Baush Machines to speed your multiple-spindle drilling, boring, reaming, tapping. No obligation.

ARMY NAVY

BAUSH MACHINE TOOL CO.
SPRINGFIELD 7, MASS.

SAFE SILENT SURE

Plus a 20% Gain in Production!

LIPE

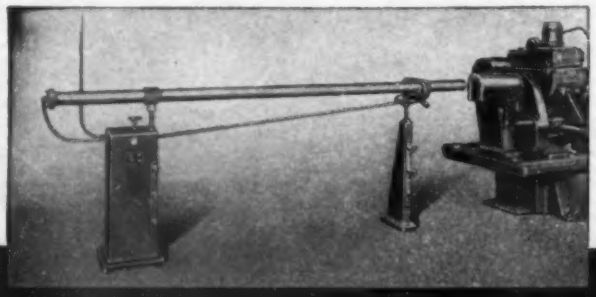
PNEUMATIC BAR FEED

NO WHIPPING ENDS TO INJURE WORKERS: NO WHIRLING BARS TO CATCH CLOTHING—When there's not enough manpower to go around, reduce the number of man-hours lost through accidents and increase the output per man-hour. Lipe Pneumatic Bar Feed helps you to do both. Stock bars are fully enclosed; can't catch clothing or injure workers. The precision, automatic feed ends danger to operator's hands. And it saves up to 20 minutes on a 12 ft. bar.

NO BANGING OR CLANGING TO FRAY WORKERS' NERVES AND SLOW PRODUCTION—Noise saps energy, increases fatigue, slows production, causes accidents and absenteeism—especially among women workers. That's why special care has been taken to insure quiet operation in the Lipe Pneumatic Bar Feed. The bar is supported at both ends; there's no banging against the tube. And the low-pressure air advances the bar silently and surely against the fixed stop.

NO MARRING OR SCRATCHING OF POLISHED STOCK: NO DEFORMATION OF THIN TUBES—Just a ball-bearing cup center in the air-piston, that's all that touches the stock. And the contact is at the very end. No feed fingers to scratch or mar, no pressure to deform thin-walled stock. You can use exact-size polished bars. Rejects are reduced. Refinishing is reduced. The number of acceptable pieces per hour is definitely increased.

UP TO 20% MORE OUTPUT AVERAGED PER HOUR—Available for all hand screw machines up to 2½" capacity, and for automatic screw machines Nos. 00, 0, 2 and 6. Drop us a line today, let a nearby technical representative call and tell you how Lipe Pneumatic Bar Feed will improve your screw machine output.



LIPE-Rollway Corporation

Syracuse, N.Y. U.S.A.

PRODUCTION *Cutting* WITH A WELLS NO. 8

CAPACITY
8" x 16" RECTANGULAR
8" DIAMETER, ROUND

To maintain metal cut-off PRODUCTION on demand output, and make your QUOTA PLUS . . . To hasten maintenance and repair work, and ELIMINATE COSTLY DELAYS on imperative production . . . Put a WELLS No. 8 to work . . . Built rigid and sturdy, it's portable, too . . . Move a WELLS SAW to the job and SAVE time, SAVE money.

WELLS Metal Cutting Band Saws are designed and produced for dependable service to meet the requirements of war time and peace time demands upon industry . . . Every second counts with a WELLS. In its Continuous Cutting Action every tooth in the blade band does its share of the work. Write for descriptive bulletin on WELLS SAWS.

Wells SAWS
THE SIGN OF SERVICE

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICH.

A New Base With a Coolant Pump Improves the Accuracy, Speed, and Finish of Jobs Honed on the SUNNEN PRECISION HONING MACHINE

Many internal honing and finishing jobs can be more efficiently handled on the Sunnen Precision Honing Machine with a stream of honing fluid flowing over the work.

For that reason, a new base and pump assembly is furnished with the machine. The new base is also available to present owners of the honing unit. The pumping unit provides a constant flow of honing fluid that acts as a coolant, carries away cuttings, and keeps the abrasive stone in sharp cutting condition. Accuracy is greater, finish is better, and speed is increased.

Other refinements include a machine light for inspecting the finish and gaging of the finished parts.

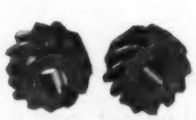
On the Sunnen Precision Honing Machine, straight, round holes are produced within .0001" of absolute accuracy. Production jobs in hardened steel have been held to a tolerance of .000025". A super-smooth finish of from 2 to 3 micro-inches provides a better working surface so that parts last longer on the job.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

Get complete information on how all these advantages can be put to work in your plant on your internal finishing jobs. A Sunnen engineer will be glad to call at your convenience — or write for free bulletin.

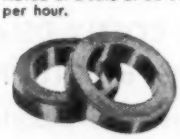
Typical Jobs

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



Bearing. A very small part. 2 micro-inch finish necessary.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

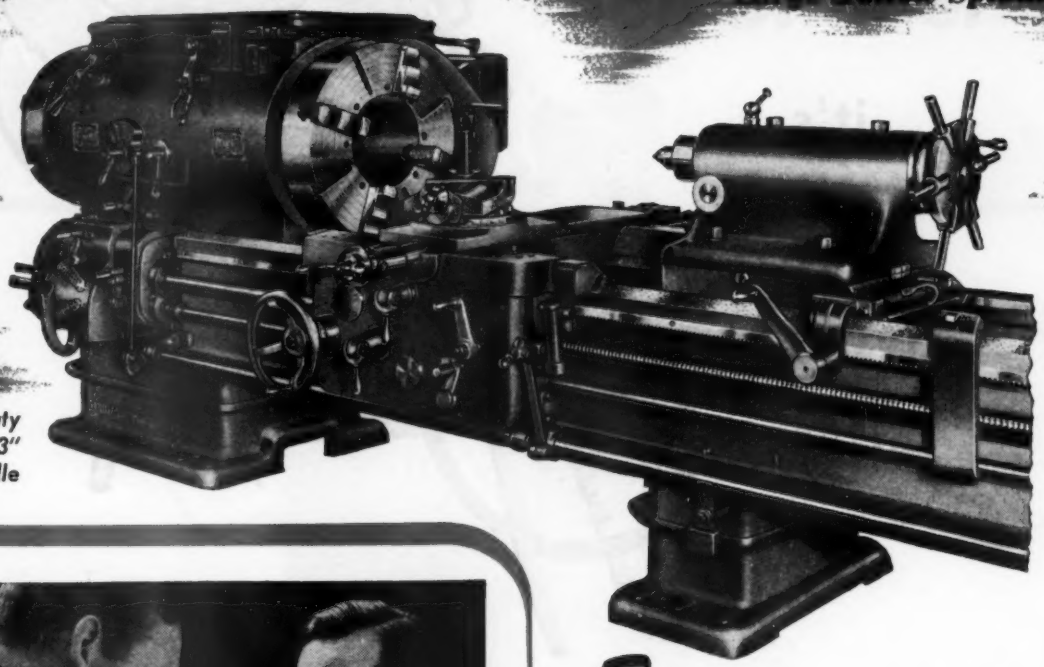
SUNNEN

SUNNEN PRODUCTS COMPANY, 7941 Manchester Avenue, St. Louis, Missouri

Canadian Factory: Chatham, Ontario

Do it Better!... on a HYDRATROL LATHE

Large Hollow Spindle Type



30" Heavy Duty Lathe with 13" Hole in Spindle

"We found 4 different machining jobs that we could do better on a Large Hollow Spindle Type of Hydratrol Lathe!"

Throughout the war—in hundreds of plants—under all sorts of conditions—LEHMANN HYDRATROL LATHES have invariably brought about faster production, better work, lower costs.

Look around your own shop—you may find a number of machining jobs which possibly could be done *better* on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a specific, time-and-money-saving recommendation.

Five Sizes-18" to 36"

Small . . . . . 18" up to 7 1/4" Hole
Medium . . . . . 24" up to 12" Hole
Large . . . . . 27" up to 13" Hole
Large . . . . . 30" up to 14" Hole
Large . . . . . 36" up to 16 1/2" Hole

(Standard type lathes, 16" to 36")

Lehmann
MACHINE COMPANY

CHOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

it's a tough grind

Despite the puffing and sweating, it often seems to grinder-men that they're not getting any place as they pedal frantically against production schedules. But they can show plenty of progress when they use Abrasive RED BAND Diamond Tools. The superiority rests in Abrasive's exclusive "Oxide-Free Process" which produces so firm a bond that even the final fraction of each diamond wears out in *useful* service.

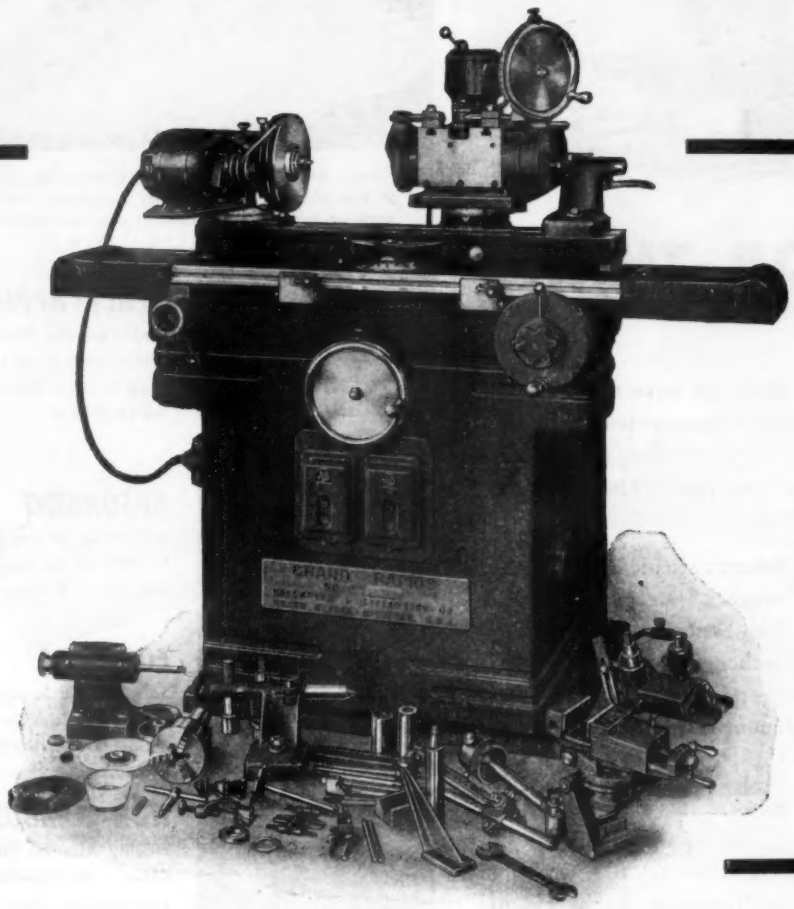
If you are not yet enjoying the many benefits offered by Abrasive, write for catalog and details.

THE CROWN JEWELS OF INDUSTRY

THIRD GENERATION OF DIAMOND EXPERIENCE

GRAND RAPIDS

No. 6 Universal Cutter and Tool Grinder



Featuring:

If interested in a Universal Cutter and Tool Grinder having these and other equally desirable features ask for Bulletin 11-1-41.

Cabinet Base Construction
Ball bearing table
Hardened and ground stainless steel table ways
Fixed table height
Cross feeding of column rather than table enabling operator to stand up close to his machine
Convenient location of all controls
All wheel shafts mounted on grease-sealed ball bearings
Provision for built-in dust collector

GALLMEYER & LIVINGSTON CO.
330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

FAMED FOR THRIFT

FORD TRIBLOCS have an amazingly long life. Given proper care—they are up on your ceiling for the duration of your plant. They are famed for thrift.

FORD TRIBLOCS are ideal for constant hard usage. Spur gear construction, ball-bearing equipped, and many other features that assure enduring efficiency, safety and low maintenance cost. Capacities: ¼ to 40 tons.

FORD SCREW HOISTS are built primarily for jobs on which smooth operation and accurate spotting of loads are required. Light weight; highly portable. Capacities ½ to 5 tons.

FORD DIFFERENTIAL HOISTS are constructed for intermittent service where speed, portability and price count. Capacities ¼ to 2 tons.

Order from your Distributor

FORD CHAIN BLOCK DIVISION

Philadelphia, Chicago, San Francisco, Denver, Los Angeles, Portland

ACCO

AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT • CONNECTICUT

NON-ABRASIVE Floor Cleaner

Fidelity Absorbo is composed of sponge-like granules and, because of the absence of any gritty substance, will not mar machine parts or surfaces with which it may accidentally come in contact.

EASILY APPLIED

Simply sprinkle Fidelity Absorbo on the oil-soaked area or on floors where oil spills are likely to occur. The amount may be varied to suit conditions.

ABSORBENT

It soaks up oil and grease accumulations up to 50% of its weight almost immediately, and affords a clean, dry surface.

FOOTSURE

Safe traction is provided both for walking and for vehicles, such as hand trucks. Thus accidents due to slipping and skidding are avoided.

NON-COMBUSTIBLE

Fidelity Absorbo has been approved as a Class 1 non-combustible by Underwriters' Laboratories. Even when thoroughly oil-soaked, Fidelity Absorbo resists burning and retards the spread of fire.

SWEEPS CLEAN!

Fidelity Absorbo may be swept up immediately after application — or allowed to remain until thoroughly saturated, in the case of recurring oil spills. In both instances, a clean dry floor surface will result.

Send for trial 50-lb. bag at $2.75 F. O. B. Newark, with unconditional money-back guarantee if not satisfactory. Substantially reduced prices for quantity orders.

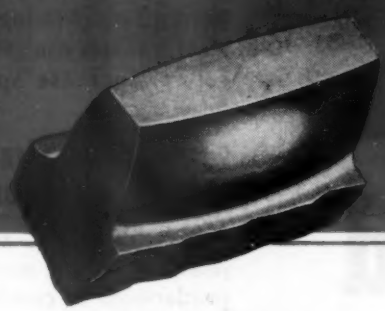
(Territories are open for local distributors. Write for details.)

FIDELITY CHEMICAL PRODUCTS CORP.

DEPT. D8, 430 RIVERSIDE AVE.
NEWARK 4, NEW JERSEY

ELLIPTOID TOOTH FORM

Will be an IMPORTANT FEATURE of POSTWAR GEARS



The ELLIPTOID (crowned) tooth form removes the greatest single cause of gear tooth failure—"end bearing." Although the crown or difference between end and center tooth thickness can be varied to suit each application, the recommended amount is .0003″ to .0005″ per inch of face. This is sufficient to prevent disastrous stresses at the most vulnerable point of the tooth—its end.

Gears with ELLIPTOID teeth withstand considerably heavier loads and have a much longer service life than gears with conventional teeth. Or, for the same torque load, gear weight can be materially reduced when the ELLIPTOID tooth form is used. Such economy will be a significant factor in meeting postwar competition.

Red Ring Gear Shaving Machines produce the ELLIPTOID tooth form without special cutters or additional machine time, and in addition, correct errors in index, helical angle, tooth profile, eccentricity and undersirable tooth roughness.

WRITE
FOR DESCRIPTIVE BULLETIN

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN • DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

For Large MACHINE PARTS

PRECISION-MADE

Call

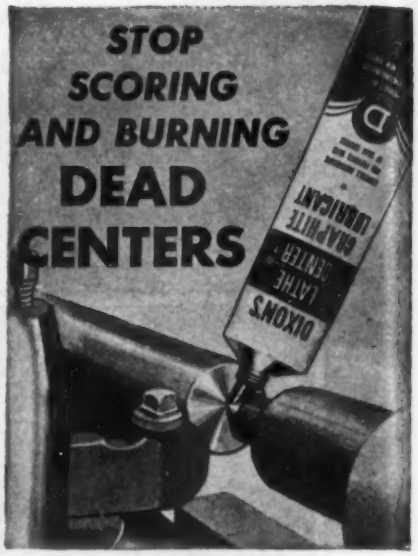
Sommerfeld MACHINE COMPANY

You get the benefit of broad and extensive experience in designing and building heavy machinery when you call upon Sommerfeld for large parts.

As manufacturers of heavy-duty engine lathes; glass making machinery; can closing, bottle closing, wire forming and other automatic machines, Sommerfeld is thoroughly familiar with precision manufacturing of heavy parts. We have been called upon to build entirely or in part such equipment as: ingot manipulators, rolling mill and finishing mill stands, ship shafting, steam driven liquid pumps, nosing machines for hot forging.

For individual parts of 50 pounds to 15 tons, get in touch with SOMMERFELD.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895



Here's a lubricant that withstands the terrific pressure and friction between the lathe's dead center and the work. Its use prevents overheating and undue wear, enables you to tighten the set-up, increase speed, take heavier cuts.

DIXON'S LATHE CENTER GRAPHITE LUBRICANT

Saves the center, reduces rejects, increases accuracy and production. A combination of pure flake graphite and extreme pressure additives. Use it also on lathe steady rests and jack screws and many other general applications where exceptional lubricating film strength is required.

D

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.
Canada: Canadian Asbestos Company
Montreal • Toronto • Vancouver • Winnipeg
Ticonderoga, No. 635 and Microfyne Graphite
Pipe Joint Compound • Graphite Seal • Graphited Oils
Cup and Pressure Gun Grease • Gear Lubricants
Waterproof Graphited Grease • Auto-Marine Grease
Graph-Air Guns • Belt Dressing (Contains no Graphite)

FAST CUTTING SPEEDS
AND
HIGH PRECISION

centered in the

HENDEY

High Speed

12-INCH MOTOR DRIVEN CRANK SHAPER

This small Hendey Shaper is remarkably versatile in the classes of work it can handle and is a time saver on both light and heavy duty service.

A maximum cutting speed of 182 feet per minute on 6-inch stroke, meets requirements for high speed backed by power and accuracy. A minimum speed of 23 feet on 12-inch stroke and 4.5 feet per minute on 2-inch stroke provides ample power for heavier work at slower speeds.

CONSTRUCTION DETAILS

Crank gears running in massive Timken bearings
Heavy duty crank pin and block
Double walled cross rail
Three bearing saddle
Power down feed
Automatic lubrication
Universal table with tilting top

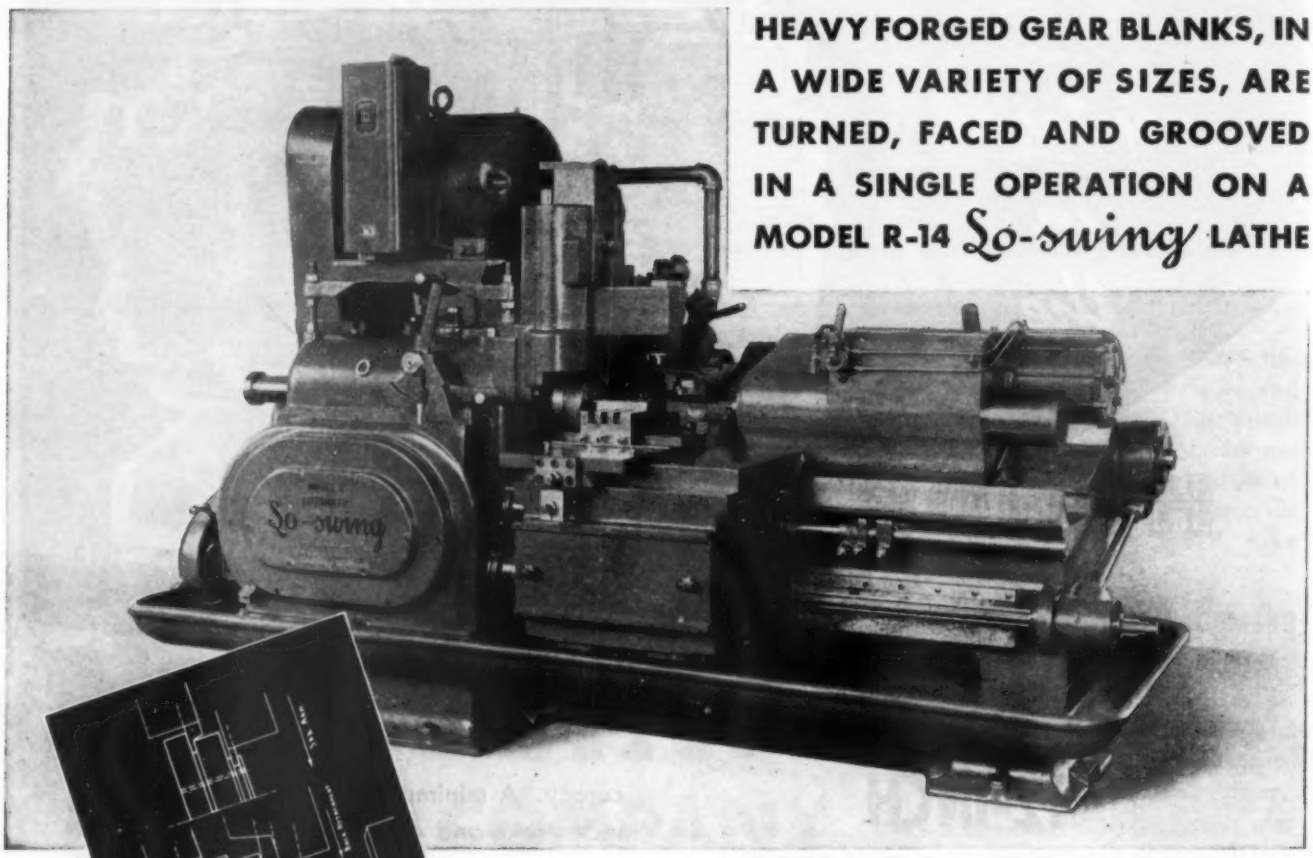
THE HENDEY MACHINE COMPANY, TORRINGTON, CONN.

BOSTON NEW YORK ROCHESTER DETROIT CHICAGO

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK

HEAVY FORGED GEAR BLANKS, IN A WIDE VARIETY OF SIZES, ARE TURNED, FACED AND GROOVED IN A SINGLE OPERATION ON A MODEL R-14 *Lo-swing* LATHE



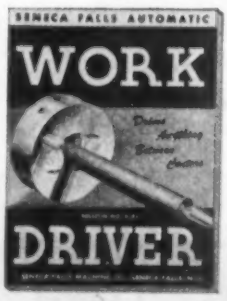
PROBLEM: To provide a single automatic lathe capable of turning, facing and grooving a variety of sizes of heavy steel gears and requiring minimum change-over time from job to job.

SOLUTION: The R-14 *Lo-swing* Lathe was chosen for this job primarily because it had the power and capacity necessary to handle heavy steel gears, varying in size from 4¼" to approximately 10" diameter. The built-in, Quick Change-over Mechanism on this lathe also provided a simple and speedy means for varying the carriage stroke, as required for each individual gear job.

Forged gear blanks come to the lathe with only the hole finished. Drive is by arbor through this hole as seen in the drawing above which illustrates typical tooling for one of the gears.

In order to simplify tooling, this Model R-14 *Lo-swing* was equipped with a standard Third Slide or Overarm which carries the grooving tools. Turning is accomplished with the Front Carriage tools while tools on the Back Attachment face the sides of the gears.

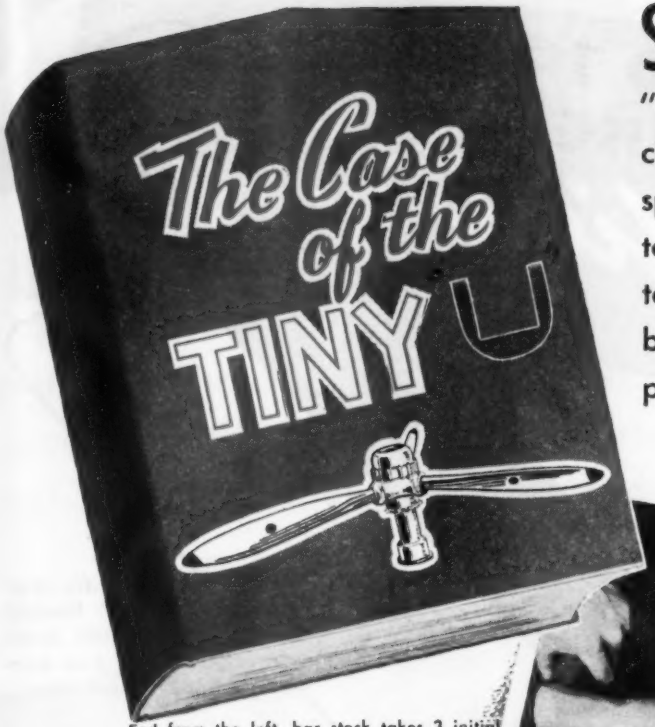
Have You Received Your Copy?



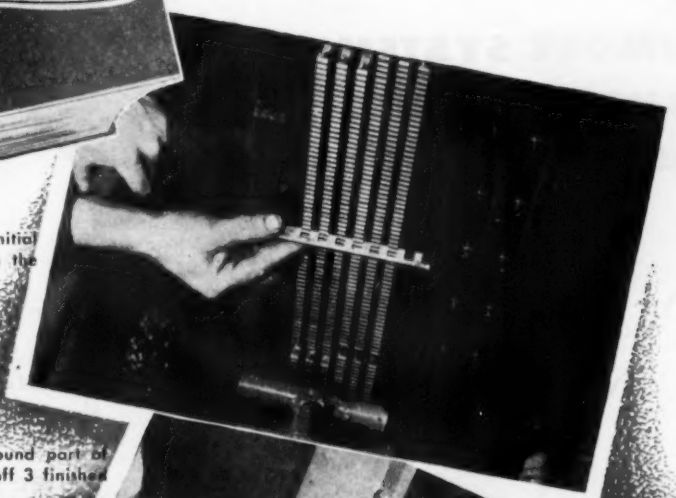
Bulletin D-43 describes 18 standardized models of this time and labor-saving Work Driver. Write for your copy today. Seneca Falls Machine Co., Seneca Falls, N. Y.

LATHE NEWS from SENECA FALLS

The Case of the TINY U



SHOWN at the left in actual size is the tiny "U" that so typifies broaching's solution of precision production problems. This tiny "U" is the spring pack retainer used in propeller blades to relieve torque stress. With capacity of 10 ton pull Lapointe designed a machine and 12 broaches to produce literally millions of these parts to fine precision tolerances.



Fed from the left, bar stock takes 3 initial rough cuts then 3 finish cuts to form the inside of the "U".

Then 3 more cuts form the round part of the "U" and 3 more cuts cut off 3 finished pieces.

Finished Parts roll down the delivery chute while operator holds bar stock showing the 12 successive cuts.

Only by Broaching was this phenomenal Precision Production record possible

ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

AN AWKWARD JOB OF GRINDING *Simplified*

THE "DUMORE SYSTEM" OVERCOMES ANOTHER UNUSUAL DIFFICULTY!

Steel ferrule, 4.529" dia., 3140 steel, heat treated. Ground mirror smooth to ±.001. Intermittent operation. Low operating and equipment costs.

After pressing the steel ferrule on to the shank of the laminated wood propeller blade, 35 hardened steel lag screws are driven in the end. When this has been done, and before the blade can be carved to shape, the ferrule must be made true and brought to size by grinding. Difficulties of handling this awkward piece were overcome by chucking the tip of the wooden blade in a 4-jaw chuck, and mounting the No. 7 Dumore Precision Grinder at the tail stock end, where working space is ample. No special fixtures were required.

Again, the combination of a standard machine tool and a Dumore Precision Grinder provide adequate facilities for a production grinding job of high precision. You'll find other interesting applications of the Dumore Precision Grinder in the complete Catalog No. 42. Get a copy from your industrial distributor or write direct to the Dumore Company, Tool Division, Dept. TE14, Racine, Wisconsin.

The range of sizes, capacities, and many suggestions for application of Dumore Precision Grinders, are shown in the complete catalog. Send for a copy, today!

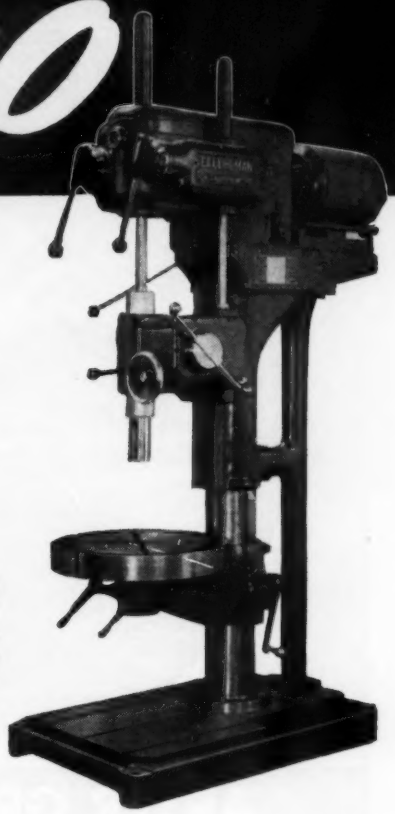
SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES

DUMORE

PRECISION AND OFF-HAND GRINDERS

One, or 1000

Whether you produce single pieces, or parts in large quantities; or make jigs and fixtures, you will want the efficiency, the precision, the high speed, the adaptability, and the long working life of Cleereman Drilling Machines and Jig Borers.



CLEEREMAN
Sliding Head Drilling Machine—made in Round Column and Box Column Types.

◀ CLEEREMAN
Feed Gear Box—sliding selective type gears of hardened steel, mounted on multi-splined shafts. Assembly is ball bearing, completely inclosed and mounted as an independent unit.

Inspecting and assembling spindle and quill for Cleereman Jig Borers.

CLEEREMAN
Jig Borer—designed to machine to the highest degree of precision.

Write for Catalogs

BRYANT MACHINERY & ENGINEERING COMPANY
Associated with **CLEEREMAN MACHINE TOOL COMPANY**
General Sales Offices **400 W. Madison St. • • • Chicago 6 • Ill. • U. S. A.**

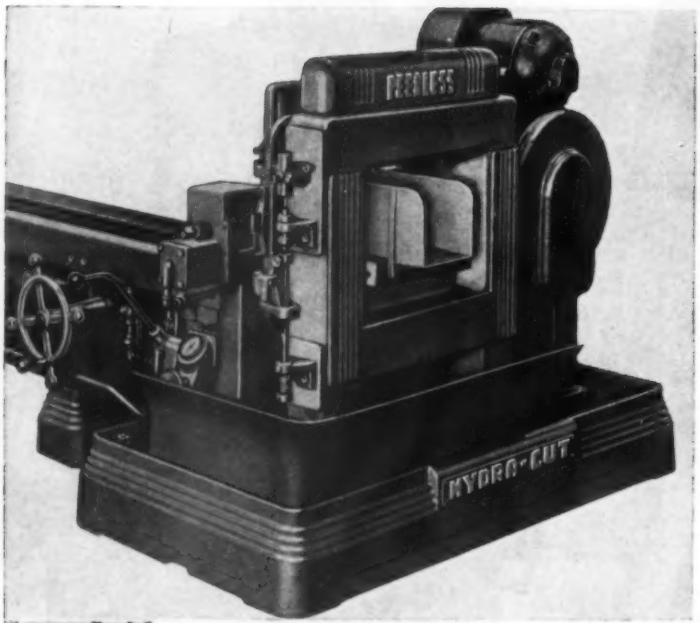
ARTER

EXACT PARALLELISM

Pre-requisite on this exacting railroad piston ring grinding job by ARTER. There are many reasons why shopmen are enthusiastic about ARTER ROTARY SURFACE GRINDERS. Versatility, accuracy, simplification of operation, are among them. For more than a quarter of a century, ARTERS have advanced progressively. Three models now available — "A", "B" and "C" with chuck diametrical capacities for 8" to 40".

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.



CONVERTIBLE . . .
for single or multiple bar, automatic cutting

In the field, the Peerless Hydra-Cut is convertible for single or multiple bar, automatic cutting by adding a self-contained conveyor and length gauge. This feature alone offers many practical advantages on clean up war contracts and is worthy of the most thorough checking by your postwar planner. The new Peerless Hydra-Cut gives you substantial increases in cutting speed, sustained accuracy, longer blade life and cooler operation. All have the Four-Sided Saw-Frame that is distortion-proof and distinctly an advantage offered *only* by Peerless. Send for *all* the facts about the new Peerless Hydra-Cut.

PEERLESS MACHINE COMPANY
1600 JUNCTION AVE. • RACINE, WISCONSIN

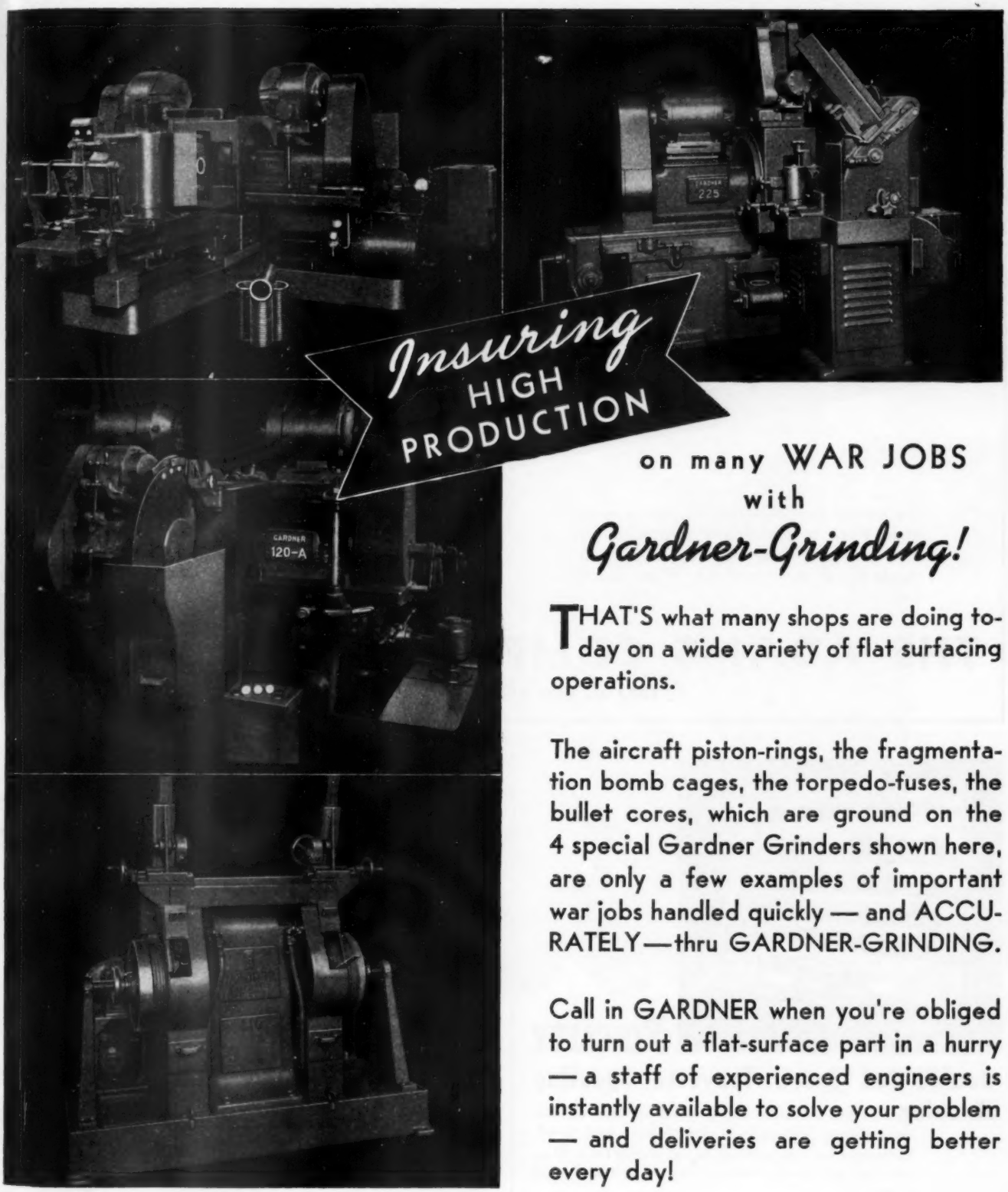
Builders of Fine Tools for Thirty Years — Acro-Matic Grinders Hydraulic Pumps . . . Blades . . . Coolant . . . Special Machinery

PEERLESS
Metal Cutting Saws

FAST ACCURATE CUTTING DEMANDS PEERLESS BLADE CONTROL

PEERLESS MACHINE CO., Dept. AM-544, Racine, Wis.
- ☐ Mail Catalog on Hydra-Cut Saw for High Production Cutting
- ☐ Mail catalog covering Vertical type used for Die Block Work
- ☐ Mail catalog on Mechanical type Saw for production cutting
- ☐ Mail catalog on general utility and maintenance Saws

Company_____
Individual_____
Street_____
City_____ State_____



Insuring HIGH PRODUCTION

on many WAR JOBS with *Gardner-Grinding!*

THAT'S what many shops are doing today on a wide variety of flat surfacing operations.

The aircraft piston-rings, the fragmentation bomb cages, the torpedo-fuses, the bullet cores, which are ground on the 4 special Gardner Grinders shown here, are only a few examples of important war jobs handled quickly — and ACCURATELY—thru GARDNER-GRINDING.

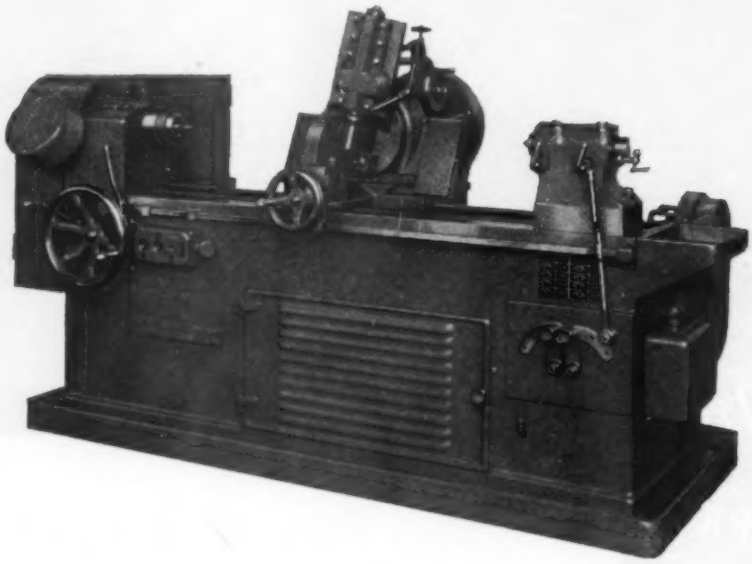
Call in GARDNER when you're obliged to turn out a flat-surface part in a hurry — a staff of experienced engineers is instantly available to solve your problem — and deliveries are getting better every day!

And – you NEED complete data on GARDNER-GRINDING for your files – WRITE FOR IT!

ARMY E NAVY

GARDNER MACHINE COMPANY

410 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY | 1905 BRIDGE STREET DUBUQUE, IOWA, U.S.A.

1883 — Our 61st Year — 1944

FIDELITY

Double-End Screw Traverse Spooling Machine . . .

For multiple-end winding of fine wires—sizes .008 to .030 up to twelve ends on each spool.

Delivers a smooth, uniform lay at speeds from 40 to 800 feet per minute—depending on size and kind of wire.

Tension and brake control prevent overrunning; slow acceleration avoids wire breakage, and adjustments provide for various wire sizes and types.

New catalog of FIDELITY Wire Spoolers describes other units. Write for it.

Buy Bonds to bring the boys down the Home Stretch

33 YEARS' EXPERIENCE

Intricate, Automatic Precision Machines

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

For *SPEED* and ECONOMY

put your cylindrical or flat work on the

"PRODUCTION"

TYPE S

CENTERLESS GRINDER

The Type S is a handy machine for grinding or polishing metals, rubber fibre, wood and similar materials. It combines a centerless feed polishing machine with a vertical or horizontal belt grinder, surfacer, polisher or buffer. It can be used for either cylindrical or flat work and quickly converted for either use.

SPECIFICATIONS

Capacity of centerless feed—¼" to 1" diam.
Abrasive belt 4" wide, 60" long
Belt speed—3200 ft. per min.
Table—4½" x 13½"
Table to floor—36"

Write for literature giving complete details.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

BIG

FOR *Big* GRINDING JOBS

In three sizes—Series 500, Series 600, Series 700

Armor plate, 32-foot railroad rails, locomotive bars and other heavy pieces are precision ground and refinished on top, bottom, sides and ends on Hanchett UK Grinders.

BIG—But it takes about half the floor space of a traveling-table grinder.

BIG—But its compact construction gives greater accuracy.

BIG—But operation is easier; controls are easily operated; lubrication is simplified.

BIG—But with the traveling wheel and stationary bed, UK requires less power to run.

Production engineers will appreciate the accurate finish of work from UK grinders, their operating ease, their enduring dependability. Plant designers and operators like the great saving in floor space and easy "set-ups" for grinding jobs. UK's are adaptable to an almost unlimited variety of work. Continuous production is possible, for while one job is being ground the next job can be set up on the unused portion of the bed. Work is under close and constant observation of the operator, who rides the grinding wheel carriage with all controls at his finger tips. Series 600 and Series 700 machines, equipped with grinding wheel heads which tilt to 30°, grind accurate bevels and precise angles. Auto feed-in and wet grinding systems are standard on all UK's.

Call upon Hanchett's experienced engineers to help you with your grinding problems. There is no obligation.

Get full details in Bulletin 170A-7.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO FIT!

HANCHETT MANUFACTURING CO.

BIG RAPIDS, MICHIGAN U.S.A.

Bridgeport

TURRET MILLING MACHINE

MILLS, DRILLS, BORES *and* SHAPES AT ALL ANGLES WITHOUT CHANGING SET UP

This universal machine is many machines in one. Its versatility and scope of operations are without parallel. Equipped with the universally used "Bridgeport" Milling Attachment, milling, drilling and boring at all angles can be handled at a single set up and with utmost precision.

While furnished as standard equipment on the Bridgeport Turret Milling Machine, the Bridgeport High Speed Milling Attachment can be mounted on any type of milling machine as well as special production equipment.

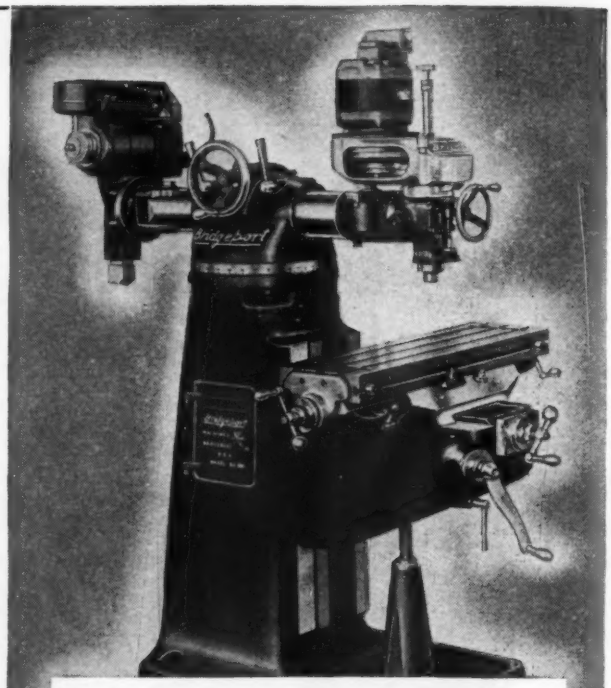
. . . *and* NOW A SHAPING ATTACHMENT

Tremendous demand for Bridgeport Machines has delayed until now the production of this much needed Shaping Attachment. It is now available not only to owners of Bridgeport Turret Milling Machines but also to machines of other manufacturers.

The Bridgeport Shaping Attachment (mounted on back end of overarm) provides the means for shaping and slotting at all angles and on a wide variety of work such as dies, mold work and intricate production jobs. It is of sturdy construction and convenient to use.

Write for Illustrated Bulletins giving complete details

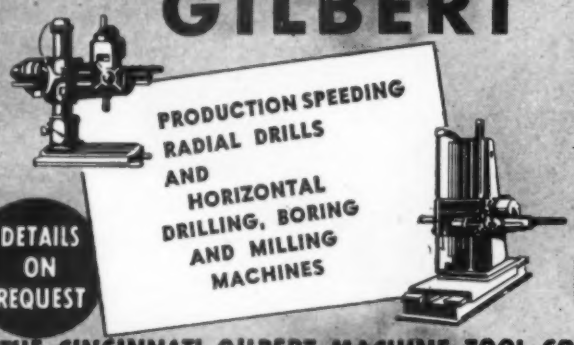
THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.



Specifications

MACHINE	MILLING ATTACHMENT
Longitudinal Feed—20" Cross Feed—9" Vertical Feed of Knee—16" Spindle to Table—17" Table—9" x 32"	Spindle Speeds, 275, 425, 700, 1050, 2100, 4250 Quill Travel—3½" No. 2 Morse or No. 7 B&S taper spindle ½ HP Motor

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES

DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

KNIGHT VERSATILE MILLERS ACCURATE - RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

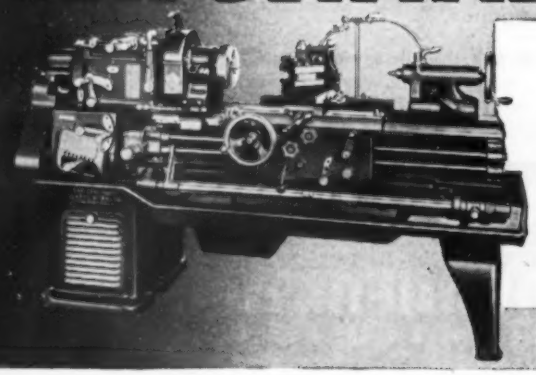
LELAND-GIFFORD COMPANY WORCESTER MASS. U.S.A. MACHINE BOOKS - COUNTERSHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

CINNATI LATHES



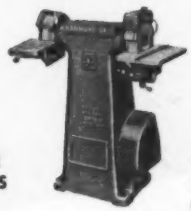
Assure High Production to Exacting Standards

Ruggedness, accuracy, versatility and speed are combined in Cincinnati Lathes in exactly the right proportion to meet the rigid demands of war production. If you will outline the aircraft, munitions or other similar jobs which require improvement in handling, our engineers will gladly offer suggestions for tooling which will assure the utmost in accuracy and output. Send for catalog giving details of Cincinnati Lathes—in sizes from 14" to 30".

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

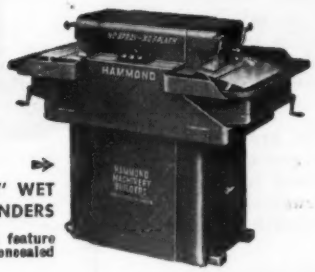
Hammond OF KALAMAZOO
GRINDING and POLISHING EQUIPMENT

CHIP BREAKER GRINDERS
Light and Heavy Duty



10" DRI 14" WET
CARBIDE TOOL GRINDERS

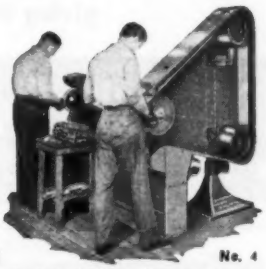
Hammond 10" and 14" Wet Grinders feature patented No Spray — No Splash concealed wheel guards.



CARBIDE TOOL GRINDERS

Hammond offers you complete carbide tool room equipment . . . Chipbreaker Grinders, 6", 7", 10" and 14" Wet-n-Dri, and 20" Wet Grinders for rough and finish grinding of all size carbide tools and hi-speed tool! Hammond products incorporate many years of practical "know-how" experience of carbide tool makers, tool engineers and shop men.

No. 3 BACKSTAND-IDLERS



No. 4

Hammond units above show typical applications of Backstand-Idlers Nos. 3 and 4, as indicated, with guards for converting polishing lathes into hi-production abrasive belt grinders or finishing machines.

10" GRINDER "WET-n DRI"

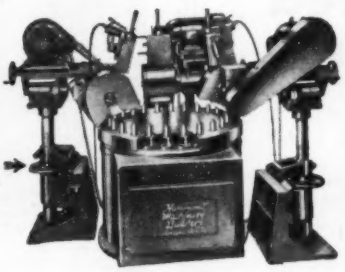
Hammond 10" giant for wide range of larger pieces.

ABRASIVE BELT GRINDERS

Hammond 4", 6" and 10" Abrasive Belt Grinders, and Backstand-Idlers for converting polishing lathes into high production grinding and finishing units, are built to the highest machine tool standards. Any material that can be ground may be surfaced, deburred, chamfered, beveled or finished by the abrasive belt method — faster, more economically and better!

INDEXING TABLE
Hammond SBL-6, 34" indexing table; 6 stations; four 5 HP, 50-81 lifting wheel heads with "Auto-Dopers".

CONTINUOUS TABLE
Hammond 48-CR-24, 48" Continuous table; 24 stations; three 7½ HP, 50-84 wheel heads with "Auto-Dopers".

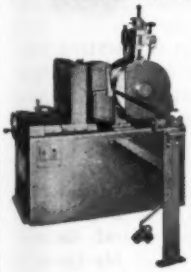


AUTOMATIC FINISHING

Hammond J-Rotary Indexing and Continuous Table Automatics are hi-production, large volume finishing machines for deburring, brushing, polishing or buffing operations. They are built in various combinations of relatively standard units combining rotary or continuous tables with wheel heads and stands to suit the particular operations required. Consult our engineers.

OTHER HAMMOND HIGH PRODUCTION MACHINES

CYLINDRICAL GRINDING POLISHING AND BUFFING
¼" to 9" Outside Diameters



Hammond standard unit for use with wheels or Backstand-Idlers and abrasive belts.

"NO DUST" and OTHER GENERAL PURPOSE GRINDERS
For wheels 10" up to 24" diameters.

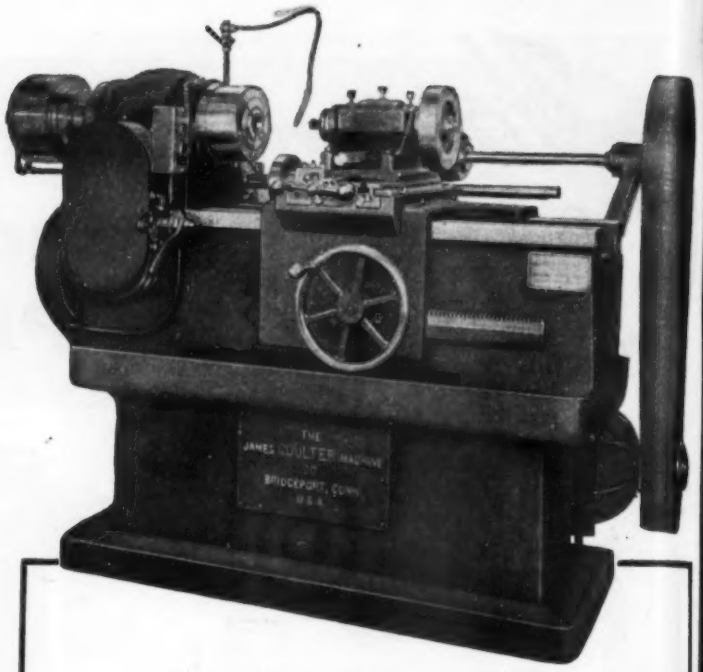
SINGLE and MULTI SPEED GRINDERS
1, 2, 3, 4 speeds, 5 to 15 HP for grinding wheels 18" up to 30" in diameter.

POLISHING LATHES
Single and variable speeds, 2 up to 50 HP capacity.

WRITE FOR LITERATURE

Hammond Machinery Builders
1618 DOUGLAS AVENUE, KALAMAZOO, 54, MICH.
EASTERN BRANCH 71 WEST 23rd STREET, NEW YORK, 10, N. Y.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

REID Hand Feed Surface Grinder No. 2C

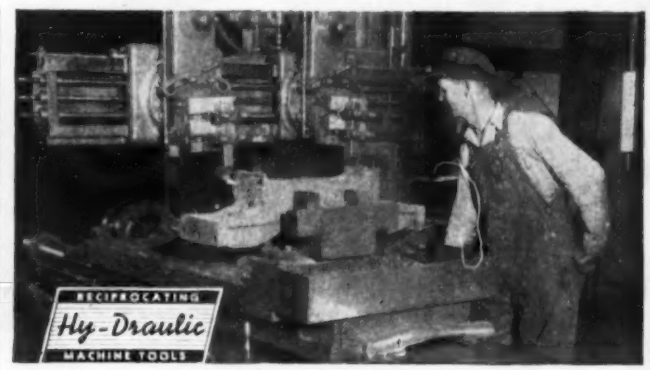
Our dealers will help you fill out necessity priority forms. Write us today for your nearest dealer's name and address.

Equipped with Motorized Spindle

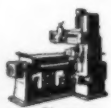
A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World



Shapers
12" to 28"



Shaper
36" Openside

Slotters
12" and 36" Stroke

Shaper-Planers
42" to 144" Stroke

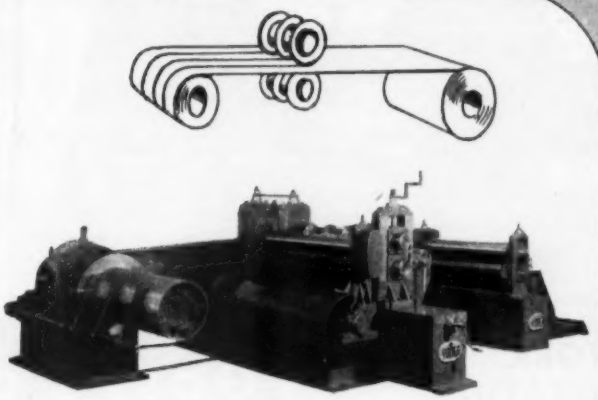
Planers

Hy-Draulic machine tools have the very important advantages of hydraulic drives and hydraulic feeds. Consequently, Hy-Draulic Machine Tools are highly productive, extremely easy to operate, very rapid in action. A Hy-Draulic Shaper-Planer at work in a railway maintenance shop is shown above, the various types of Hy-Draulic Machine Tools are indicated at left and below. Complete information about all Hy-Draulic Machine Tools will be sent promptly in response to requests for Catalog 1110.

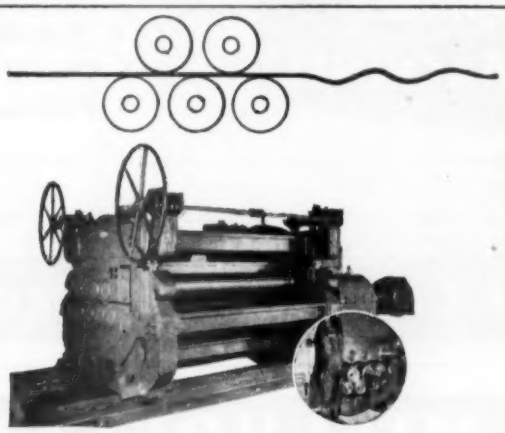
Hy-Draulic **ROCKFORD MACHINE TOOL CO.**
ROCKFORD, ILLINOIS, U. S. A.

YOU GET THE IMPROVEMENTS FIRST FROM *Yoder*

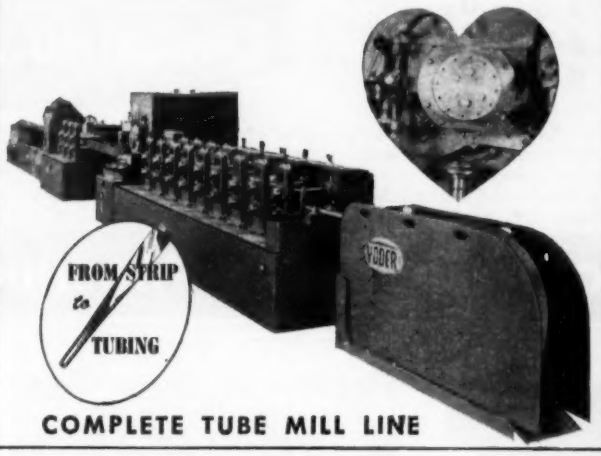
ROLL FORMING MACHINES



SLITTING LINE



HEAVY DUTY PLATE LEVELER



COMPLETE TUBE MILL LINE

MEET THE NEW PROBLEMS *with* YODER

Problems! Problems! Problems! Problems!

When it is a high-production metal working machinery problem . . . call on Yoder's engineering and manufacturing facilities.

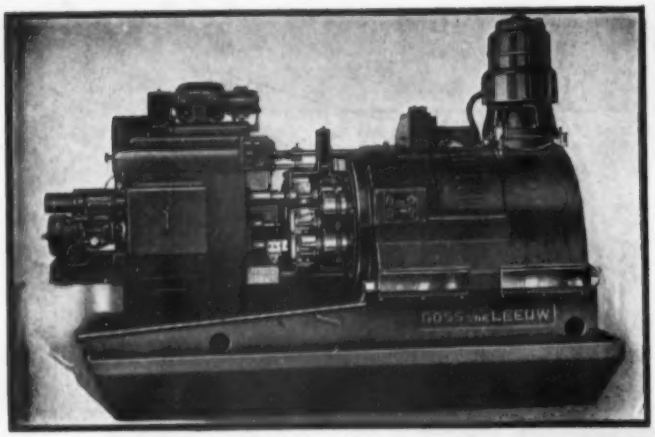
Practical plans for solving such problems can best be formulated when specialized experience is brought to bear upon them. Rely on Yoder's thirty years of experience to create a machine with a *plan of action* built into it that will help you to meet the new conditions.

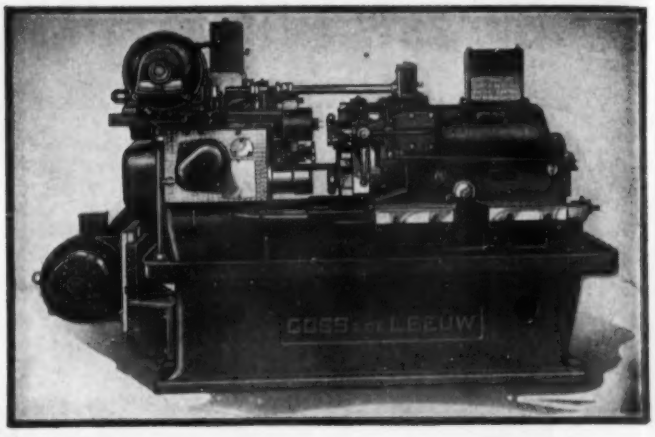
We have a general bulletin that presents a large variety of our *regular* line of machines. However, if yours is a special problem, send us rough notes and sketches. You'll be pleasantly surprised at our response.

THE YODER COMPANY
5500 WALWORTH AVENUE, CLEVELAND 2, OHIO

ENGINEERING YODER MANUFACTURING

METAL WORKING MACHINERY





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Profit-maker for the TOOL-MAKER

When you schedule small toolroom jobs on heavy, large-capacity machines it's like going shopping in a heavy truck. Don't waste power and tie up such equipment. Save toolmakers' valuable time . . . use the

LINLEY

HIGH SPEED VERTICAL
MILLING AND JIG BORING MACHINE

. . . a compact, velvet speed, all round machine, designed and built to take a multitude of small jobs, such as die making, jig, pattern and model making, milling, drilling, reaming and jig boring. Eight spindle speeds to 4250 r.p.m.; direct micrometer setting; counter-balanced quill to remove backlash; table size 7" x 17½"; floor space 18½" x 20" . . . all the features required to earn substantial profits in any toolroom.

Send for Bulletin which covers all details.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1 CONN.

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** *Units*

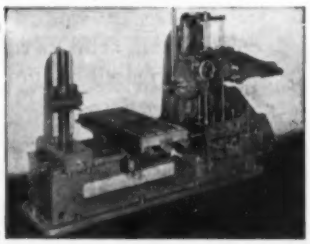
½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

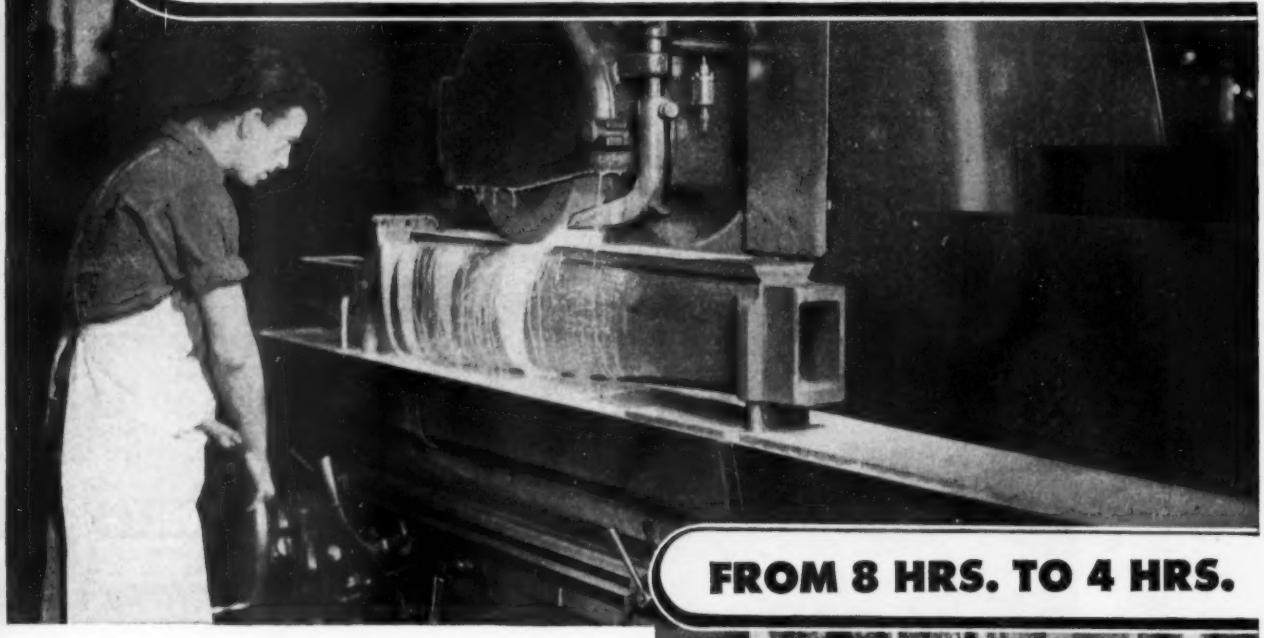


Standard Universal 3" Spindle Machine

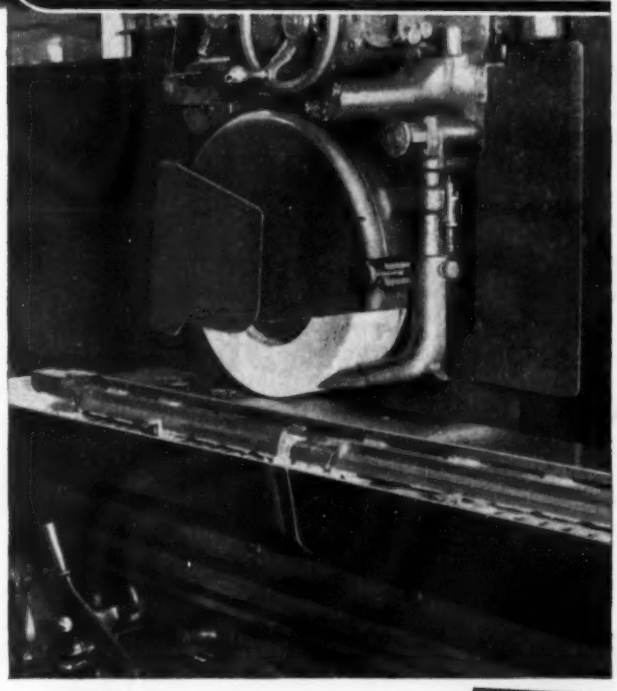
UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

MATTISON GRINDER

CUTS TIME FROM 1½ DAYS TO 3¼ HRS.



FROM 8 HRS. TO 4 HRS.



A considerable saving in man hours has been effected at Barber-Colman Company with their Mattison High-Powered Precision Surface Grinders. For example — the job shown above on overarm casting for Type-T Hobbing Machine was formerly hand scraped in a day and one-half. It is now finish ground on a Mattison Grinder in 3¼ hours — The table platen which required 8 hours to hand scrape, is rough and finish ground top and bottom in 4 hours. Both of these jobs are held to close limits of accuracy. On numerous other parts, similar results are obtained.

The massive double column support, high power and rigidity of construction of the Mattison Grinder, combine with accuracy and speed of operation to provide savings of this kind on jobs previously finished by other methods.

They are built in a wide range of table sizes to meet every requirement from 12″ to 36″ wide by 36″ to 192″ long.

Write for latest circular and Set-up Book containing further data and information.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

KNOCK-OUT UNIVERSAL TOOL GRINDERS . . .

Are being used 24 hours a day by the leading industries all over the world, doing their part of a big job.

Maintenance or production at minimum time and capital expenditures.

This new literature is yours. Write for: Bulletin UTG-43-AM for illustrative information on Universal Tool Grinder . . . Bulletin CTG-43-AM for illustrative information on Universal Carbide Tool Grinder.

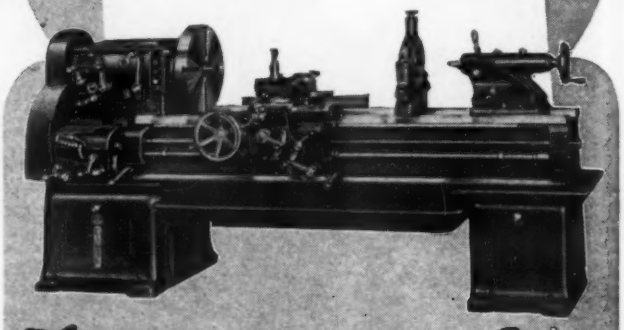
K. O. LEE COMPANY
ABERDEEN SOUTH DAKOTA

Metalmaster

12", 14" & 16" LATHES

Offer: Infinite range of threads and feeds. Easy gear adjustment. Independent motor mounting. Short, direct drive. One control for all threads. Ample power for heaviest cuts. Automatic stop for feeds.

Catalogs sent on request. Write for yours!



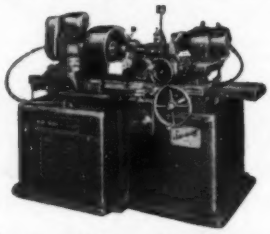
The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

The *Sav-way* M-H-2 Internal Grinder

Combines Hand and Hydraulic Operation



Neoprene Insulated Against Vibration

For the first time in one machine, all the advantages of hand and hydraulic table operation! The bed is insulated from the base by neoprene pads, which prevent floor vibration and distortion of the base from being transmitted to the bed. Equipped with the famous Sav-Way Gold Seal Spindle—the spindle that breathes! Seventeen exclusive features.

This machine is setting production records in 'round-the-clock wartime operation.

Send the Coupon for Illustrated Literature

Sav-way INDUSTRIES • DETROIT
Machine Tool Division

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Mich.
Please send descriptive literature covering the Sav-Way M-H-2 Grinder.

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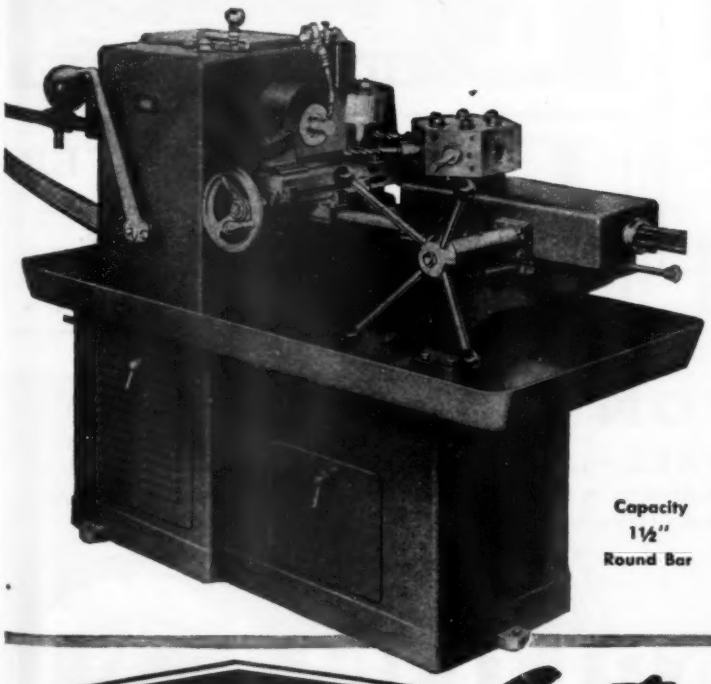
Note these 7 Advantages

(Reported by an Owner of Oster "Rapiduction" Lathes)

1. "Replaces expensive machines"
2. "Replaces experienced workers"
3. "Sturdily built"
4. "Wide application"
5. "Maintains accuracy"
6. "Up-keep very light"
7. "Keeps costs under control"



Capacity
1½"
Round Bar

Those 7 advantages summarize a more detailed statement made by a manufacturer of bomb parts and 37 mm. shells. His comments regarding the performance of Oster No. 601 "Rapiduction" Lathes check with the experiences of hundreds of other owners of these modern SIMPLIFIED machines.

Low initial cost, low operating cost, low maintenance cost combine to make Oster "Rapiductions" the most practical machines for a wide diversity of bar and chucking operations.

The Oster No. 601 "Rapiduction" can be furnished with the automatically indexed, six-station turret or with plain saddle and single tool post. Either the WORM DRIVE or the DIRECT DRIVE can be furnished depending upon spindle speeds required.

An Oster Distributor near you will supply you with illustrated Catalog No. 27-B. If you don't know his location, write:

THE OSTER MANUFACTURING CO.
2049 East 61st Street • Cleveland 3, Ohio, U.S.A.

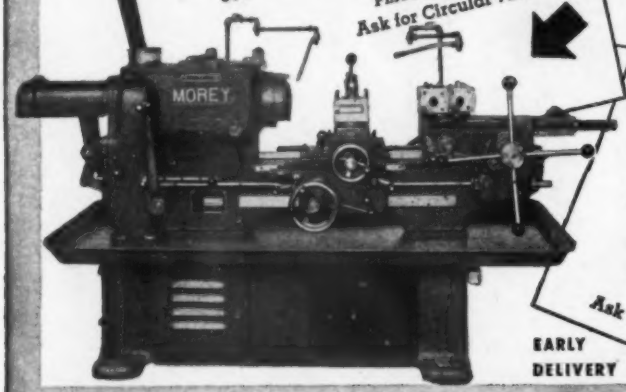
OSTER *Cuts Your Costs!*

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

#2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

#4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



EARLY DELIVERY

INFINITE SPINDLE SPEEDS —Electrically Selected—

DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. IG	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

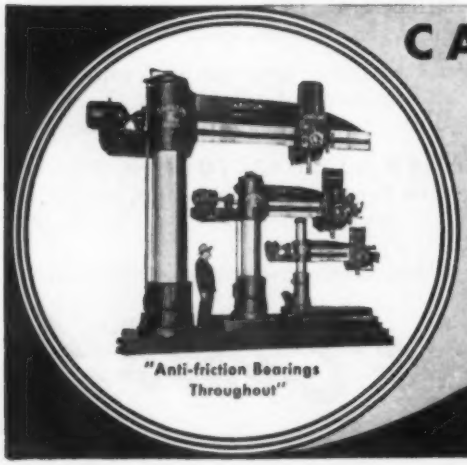
Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

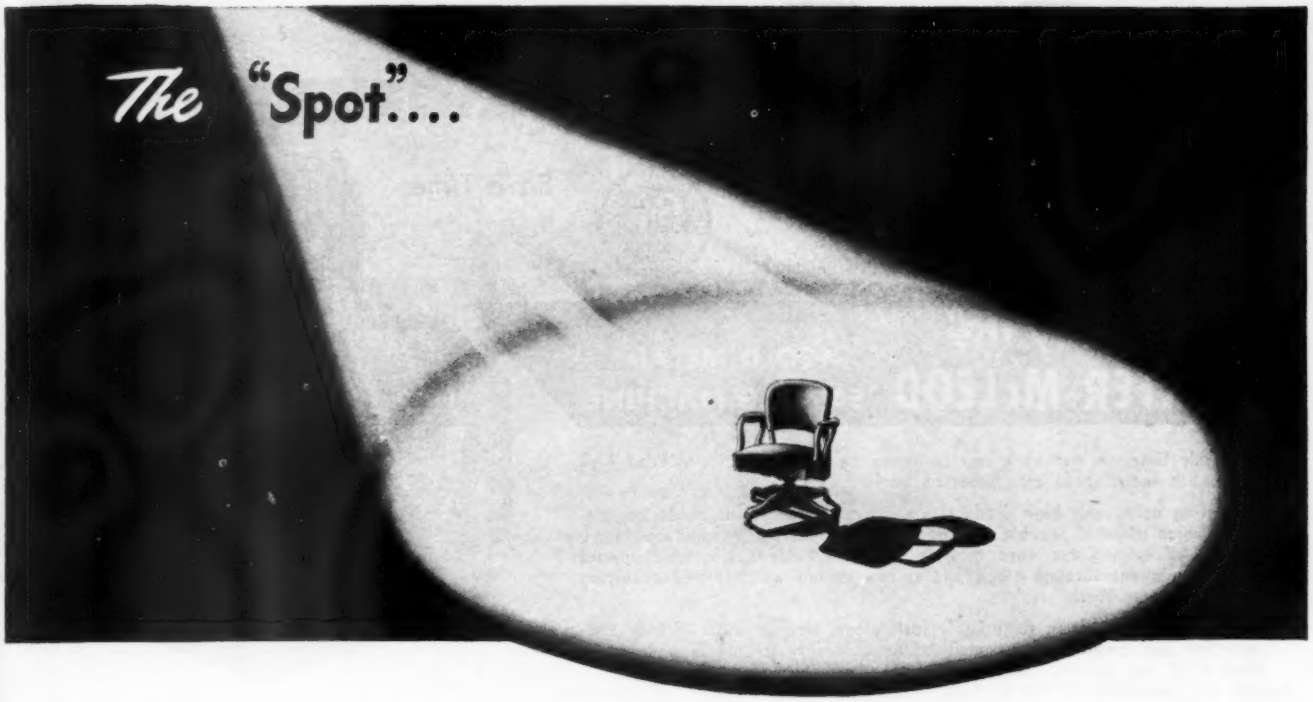
DAVIS KEYSEATER
This low cost machine will handle internal keyseating jobs up to 1¼ in.
Write for illustrated bulletin.
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

CARLTON RADIAL DRILL
FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.


"Anti-friction Bearings Throughout"

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY



Waiting for Executives who neglect Postwar Planning NOW!

SNYDER can save you time, money and effort by helping you plan production and production machines . . . WHEN YOU PLAN YOUR PRODUCT

Sure you're busy. But, to postpone the planning of postwar production "until the pressure eases a bit" is to invite trouble. And when that trouble arrives, you'll have no more time than you have now.

Maybe your postwar product *is* "all set" and you figure that this fact gives you a breathing spell. Actually, this should be your No. 1 reason for pressing forward with production plans. A roll of drawings in the vault, and tool room models on the shelf are cold comfort to a dealer clamoring for merchandise.

Also, planning production and designing and building production machines often is a much bigger job than planning the product. It all takes time and time grows increasingly precious as the months go by.

The ideal way, of course, is to plan your production when you plan your product. By doing so, it often is possible to make comparatively simple alterations in product design or in machine design which greatly improve production efficiency and proportionately reduce costs.

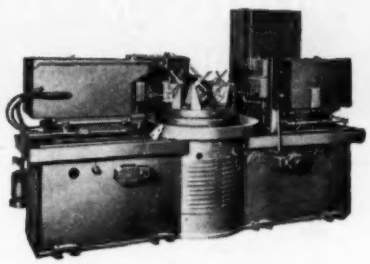
Snyder's 20 years experience in designing and building special-purpose machines for many types of industry is at your service *now*, ready to help you with your production plans.

With such plans completed, your machines will be ready to start through the Snyder plant as soon as present restrictions are lifted and delivery to you can then be accomplished in the shortest possible time.

We invite you to write us in full confidence. *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.*

SNYDER
DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

PLAN Your PRODUCTION when you PLAN Your PRODUCT



SNYDER KNOWS HOW

This unique 3-way, hydraulic, special-purpose machine is designed and built by Snyder for keyseating and milling valve rocker covers for aircraft engines.

Normally this would require three operations on individual machine set-ups and six handlings of each part.

On this machine each pair of parts is completed in one operation and one handling, thereby maintaining greater accuracy of relationship in the two keyways, saving time, reducing labor fatigue.

Operating mechanisms are mounted on main slides which, in rear position, allow ample clearance for indexing.

Keyseating tools are actuated through a crank mechanism and are fed up and down by hydraulic cylinders through a feed cam. The milling cutters on rear unit are fed into the work in the same way.

The tools on side units feed into work while rear unit cutters cut clearance pocket for second slotting tool.

20 Years of Successful Co-operation with Leading American Industries

FASTER CUTS

CLEANER CUTS

STRAIGHTER CUTS

Save Time

Save Costs

assured by the PORTER-McLEOD COLD METAL SAWING MACHINE

Valuable time on war work can be saved by the 8" Porter-McLeod high production machine on all classes of work.

Its rating as a truly high production machine is the result of design features which make it possible to nest bars or shapes for multiple cutting, a method of holding the work securely during fast feeds, a unique upward blade movement through stock and a saw design which provides cutting action by every tooth.

These features result in remarkably fast, clean, straight cuts. Sturdy construction and ample power contribute to its ability to handle a standard feed of 3" per minute. Capacity: 8" round or 7½" square stock.

Explore the possibilities of the 8" Porter-McLeod Machine on your high production cold metal sawing operations. *Write today for Descriptive Bulletin.*

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U. S. A.

PORTAGE

NO. 4

HORIZONTAL BORING DRILLING & MILLING MACHINE

• Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.

AKRON 11, OHIO

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL

913 Tilden St.

Saginaw, Michigan

LUCAS "PRECISION"

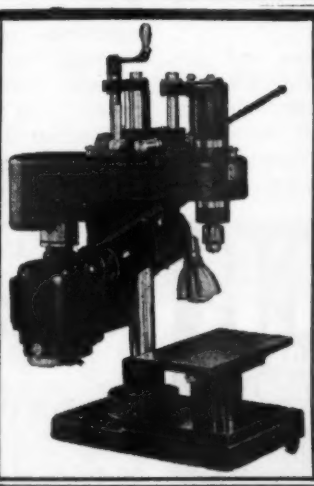
Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND

OHIO, U. S. A.



HAMILTON-MUEHLMATT

"VARIMATIC"

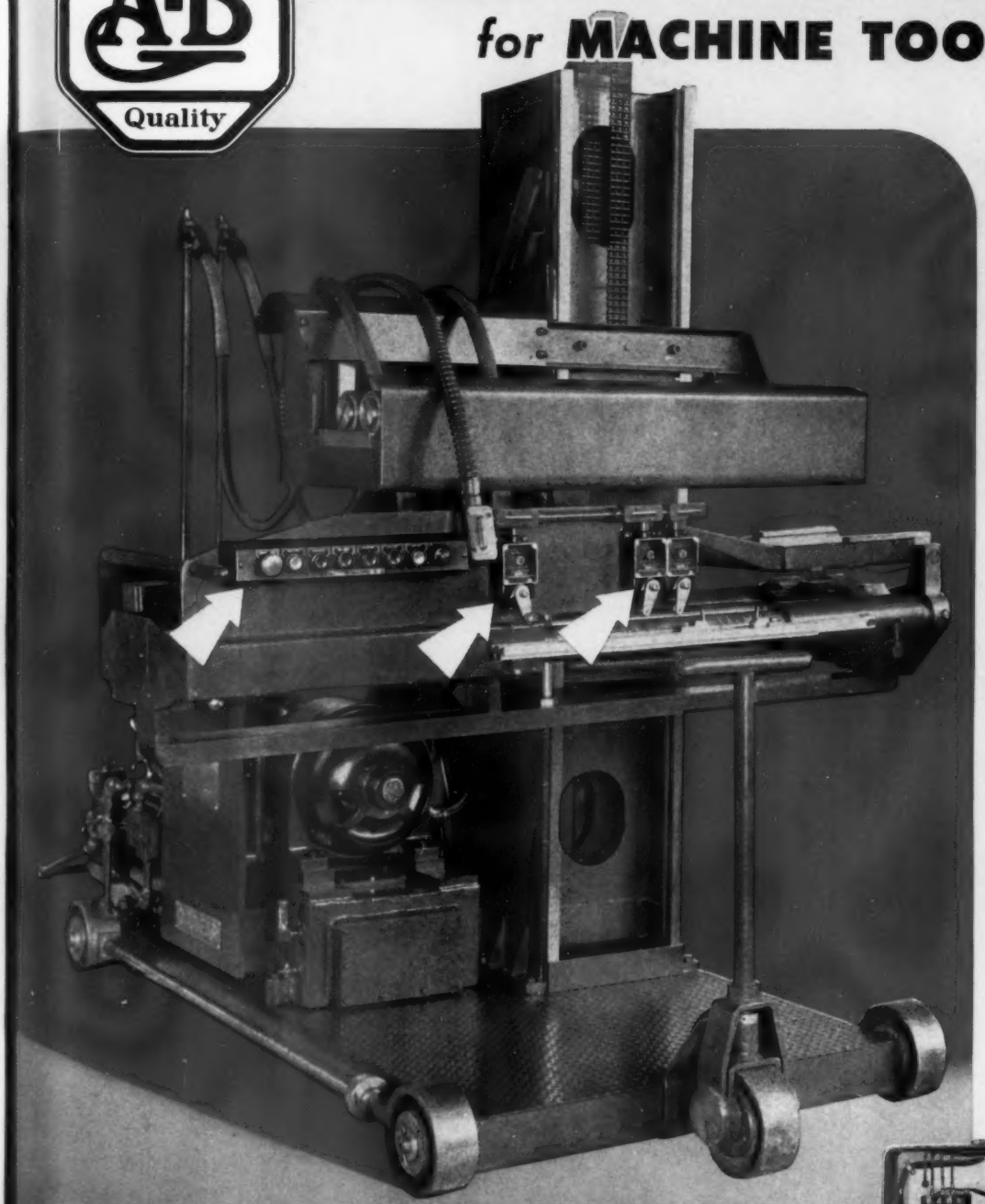
offers a wide range of super sensitive drilling speeds

The wide range of drilling speeds provided in the "Varimatic" makes it adaptable for the finest of tool room work, instrument, diesel, electrical, airplane and similar precision work. It is built to "instrument precision" and has a capacity for drills from .004" to 5/16" inclusive. Speed Ranges as follows—Low Range—Minimum 840—Maximum 2700—High Range—Minimum 2900—Maximum 9300. Write for details.

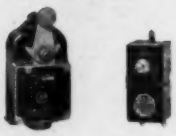
The Hamilton Tool Co.

HAMILTON OHIO

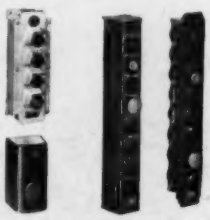
AUTOMATIC MOTOR CONTROLS *for* MACHINE TOOLS



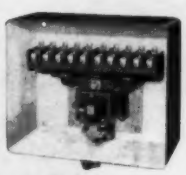
Automatic sequence operation steps up machine tool output. But such sequence control requires split-second accuracy of contactor operation and unfailing performance. That is why so many machinery builders are adopting A-B controls. You will find in the Allen-Bradley line all the standard controls necessary to provide the particular cycle of operations that your machine demands. Our engineers will gladly help you with your problems.



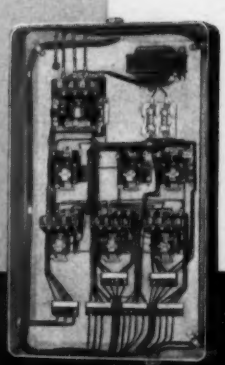
Bulletin 801-2 — A complete line of standard, heavy duty and precision limit switches.



Bulletin 800—There are over 800 varieties of standard and heavy duty A-B push buttons.



Bulletin 700 — Small solenoid operated relays are available in single and multiple pole construction.



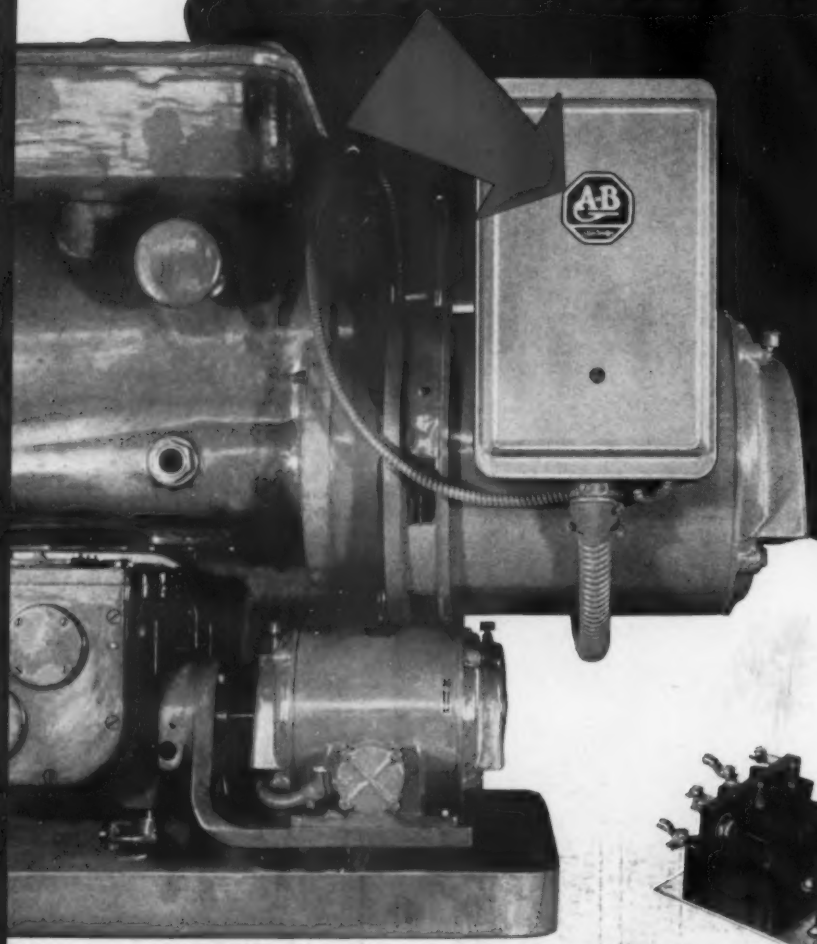
This special panel controls the sequence operation of the above machine. A-B relays and contactors provide the split-cycle performance which means extra production of highest quality.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROLS FOR ALL INDUSTRIES

QUALITY

Here's a sure sign of
TROUBLE-FREE MOTOR CONTROL



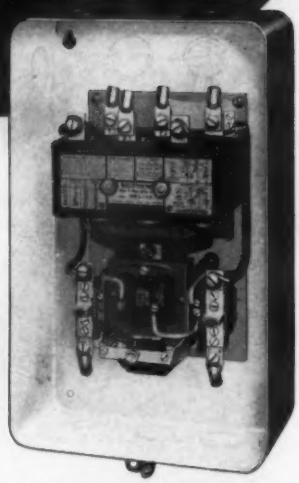
ONLY ONE MOVING PART

DOUBLE BREAK,
SILVER ALLOY CONTACTS

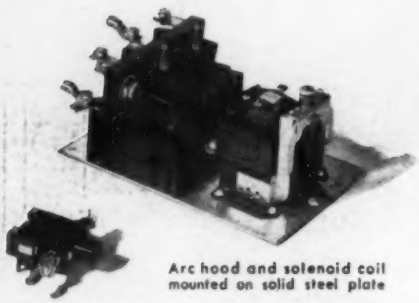
DEPENDABLE
OVERLOAD PROTECTION

HIGH INTERRUPTING
CAPACITY

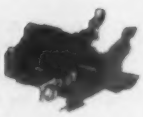
SPLIT-SECOND ACCURACY



Allen-Bradley Bulletin 709 Size 2
Across-the-line Solenoid Starter

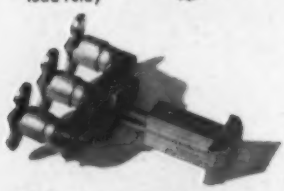


Arc hood and solenoid coil
mounted on solid steel plate



Thermal overload relay

Arc hood cover



Solenoid plunger with double break, silver alloy contacts

The Allen-Bradley trade-mark is the mark of quality. A-B solenoid starters are dependable and trouble-free because they are so simple. They have only one moving part—the one-piece solenoid plunger that opens and closes the double break contacts with a straight-line vertical motion. There are no pivots, no pins, no bearings, no hinges, no flexible jumpers nor other trouble-breeders to cause starter failures. Furthermore, the silver alloy contacts never need to be filed, cleaned, or dressed. Just install A-B solenoid starters . . . and forget them. They're good for millions of trouble-free operations. That's why the A-B trade-mark means reliability and quality in motor control.

Allen-Bradley Company, 1316 S. Second Street, Milwaukee 4, Wisconsin.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

EIGHT *things to think about*

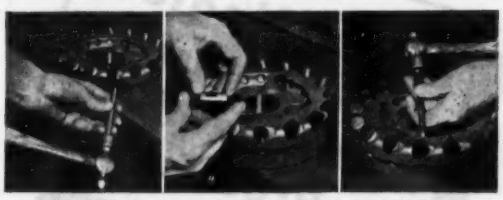
BEFORE ORDERING ANY MILLING CUTTER

There are eight fundamental points that should be covered before ordering any milling cutter. On these depend the accuracy, production, dependability, and profit of your milling machines.

1. An inserted-tooth type cutter has the advantage of highest strength in the body and hardest material at the cutting edge without compensation for either—plus the maintenance feature of merely changing blades rather than replacing the complete mill.
2. The serrations, for locating the blade in the body, should be on the front of the blade so that the back will have a plain surface to contact *fully* on a plain surface in the body.
3. The blade locking device should be simple and *positive* so that blades are an immovable part of the assembly even on heavy, intermittent cuts.
4. * Advancing, replacing, and sharpening of blades must be a simple, easy, accurate operation that will reduce down-time to a minimum.
5. Body and blade design must be such that HSS, carbide tipped, and alloy blades can be used to full advantage under high speeds and heavy feeds.
6. Production should not be handicapped through inability to replace any type of blades quickly from the supplier's stock.
7. Blades must be interchangeable in every mill and interchangeable in as many mill styles and sizes as is practical without sacrificing strength or cutting qualities.
8. Choose a reliable milling cutter manufacturer who is equipped with the background and engineering skill to supply standard or special designs that are right—and delivered on time.

We hope you will try this check list on Lovejoy milling cutters and the Lovejoy Tool Company. We believe you will check it 100%, just as others have done for the past 27 years.

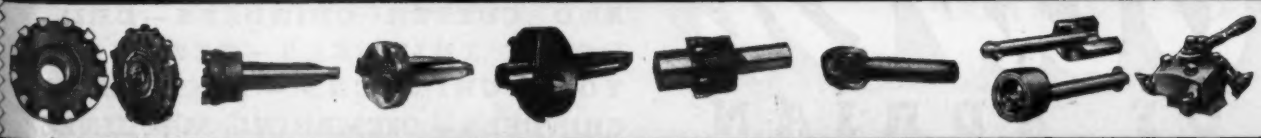
* Lovejoy manufactures a complete line of inserted-tooth type products—all equipped with the famous Lovejoy positive-locking device to assure maximum production at minimum cost. The illustrations at the right show how simple it is to keep Lovejoy tools at highest cutting efficiency.



Tap out the wedge— Move the shoe down— Tap in the wedge—Grind

IT'S AS SIMPLE AS THAT!

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.



MILLING CUTTERS · BORING HEADS · ARBORS · SPOT FACING TOOLS · COUNTERBORES · BORING BARS · SINGLE POINT TOOLS · TURRET TOOL POSTS

DRILLS *are fighting tools today...*

Keep 'em fighting the "OLIVER" Way!

A drill that is off-center, or that fails under the pressure of wartime production, is like a machine gun that jams at the height of an attack. For drills, like other tools, are weapons in a real sense today . . . wielded in the decisive battle of production.

Keep every drill in your plant working at top efficiency by equipping your toolroom with OLIVER DRILLPOINTERS. By means of completely automatic cam-controlled action, No. 510 Oliver Drillpointers enable unskilled operators to produce the exclusive Oliver hollow-ground point that saves drills, speeds up operations, reduces load on machines. Quickly set up for all drills from 1/4" to 3" dia., for any point angle from 82° to 160°, enabling you to select the point that is exactly right for the material being drilled.

Keep your drills and other cutting tools "on the offensive" with Oliver Drillpointers and Tool Conditioners. Write today for full details on any of the Oliver production-speeding machines listed below.

OLIVER NO. 510 DRILLPOINTER (above). Automatic operation produces patented Oliver point and variable clearances. For drills from 1/4" to 3" dia. Ball bearing mounted main shafts and Timken-equipped grinding spindle assure ease of operation and sustained accuracy.

OLIVER NO. 21 BENCH DRILL GRINDER (below). Hand operated for drills from No. 57 to 1/2". Attachments available for grinding oil hole drills, left hand and other special points.

OLIVER INSTRUMENT COMPANY
1414 E. Maumee St., Adrian, Michigan

Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

Gairing four flute step-multiple Tungsten carbide tipped cutter used in the production of parts for a marine engine.

Gairing Tungsten carbide tipped multi-diameter cutter for boring, facing and chamfering operations on airplane engine cylinder heads.

Gairing profile-ground radius cutter combining multi-diameter boring flutes and core drill used in the production of a tractor engine.

Tools that translate ideas into realities

The end cutting tools illustrated here are the net result of creative ideas that first existed in the minds of engineers; ideas about a marine engine, an aircraft engine and a tractor engine. These ideas were passed on to us for translation—for the design and manufacture of the *special* Tungsten carbide tipped cutting tools necessary for the practical, low-cost production of the metal parts required for translating ideas into realities.

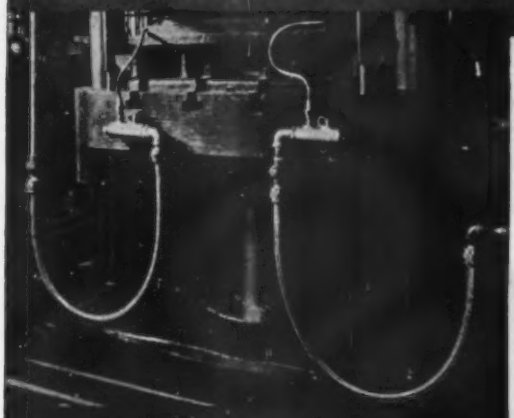
We have been translating ideas into realities for more than a quarter century. Send us your sketches or outline drawings.

GAIRING

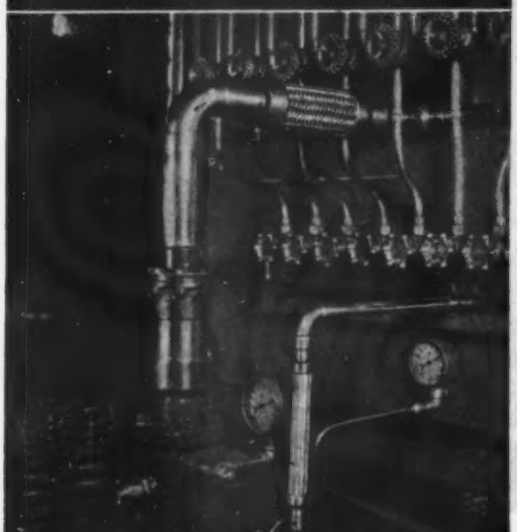
THE GAIRING TOOL COMPANY, DETROIT 32, MICHIGAN

MANUFACTURERS OF STANDARD, SPECIAL AND GAIR-LOCK INSERTED BLADE CUTTING TOOLS

SEAMLESS METAL TUBING
...flexible as a blacksnake whip



Conveying steam and connecting moving parts



Conveying gas and liquid, connecting misaligned parts, absorbing vibration

meets a thousand exacting requirements

The tubing is American Seamless Flexible Metal Tubing—the most reliable type of flexible metal conveyor obtainable where *absolute tightness is essential.* Because it is jointless it is, in effect, a flexible pipe.

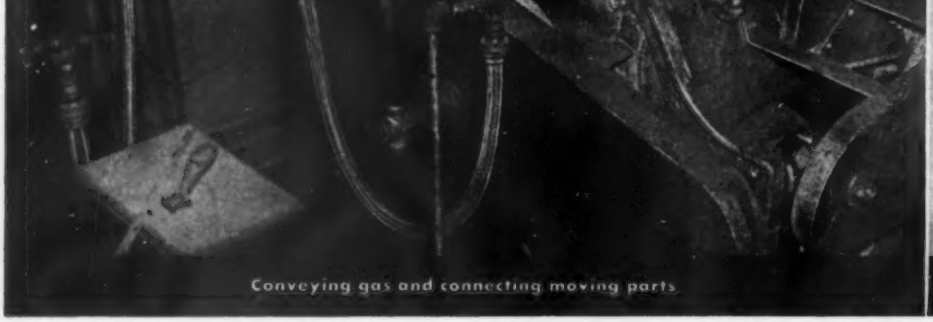
Applications are practical in literally thousands of places in industry. Typical functions are illustrated on this page:

1. *For conveying steam.*
2. *For conveying liquids and gases.*
3. *For absorbing vibration.*
4. *For connecting misaligned or moving parts.*
5. *For protecting electrical wiring.*

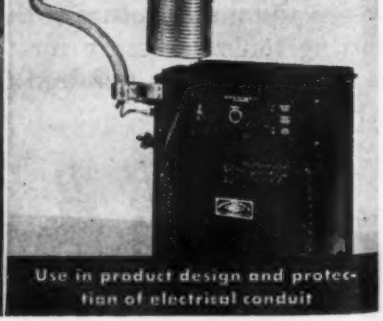
Our technical department is experienced in designing flexible metal assemblies for specific applications. If you have a particular problem, maybe we can be of assistance to you. 44192

AMERICAN METAL HOSE BRANCH
OF THE AMERICAN BRASS COMPANY
ANACONDA
Subsidiary of Anaconda Copper Mining Company
General Offices: Waterbury 88, Connecticut
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

American Metal Hose



Conveying gas and connecting moving parts



Use in product design and protection of electrical conduit

HERE'S REAL CUTTING SPEED

OVER 30" PER MINUTE WITH THE Airco "45" TIP

When manufacturers want really fast machine gas cutting, they use the Airco "45" High Speed machine cutting tip.

For example, De Bourgh Manufacturing Company, Minneapolis, Minn., designed a simplified one-piece laundry stand (shown at right) to be flame-cut out of ¼" mild steel plate. Using an Airco "45" No. 0 tip, they cut the entire stand contour in one operation at a speed of over 30" per minute. 28 lineal feet of cutting with eight separate starts were required for each stand.

This performance is typical of the increased cutting speed provided by the Airco "45." Thanks to its divergent exit design and its use with higher gas pressures, the Airco "45" exceeds by 20% to 30% cutting speeds possible with standard design tips. For additional information, write your nearest Air Reduction office.

This one-piece laundry press stand is flame-cut quickly with the Airco "45"; then bent to shape and welded at the corners.

Stack cutting laundry press parts out of 10 gauge steel—ten pieces at a time. With the Airco "45" tip, cutting speed was 14" per minute.

★ BUY UNITED STATES WAR BONDS ★

AIRCO WILSON

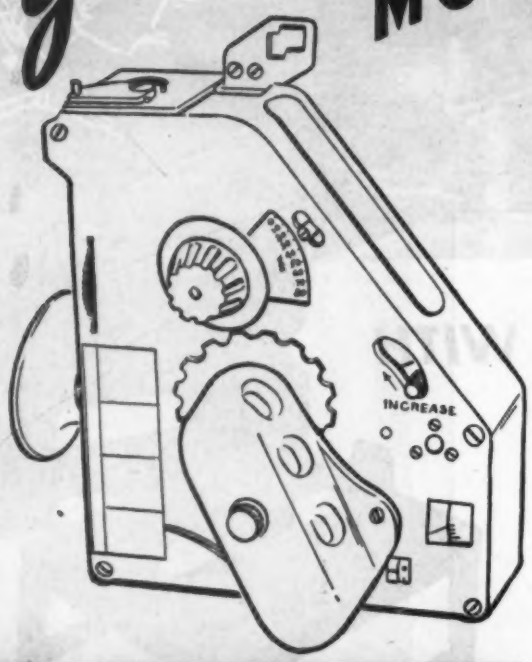
AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities

Just suppose you asked us to make a MODERN SEXTANT

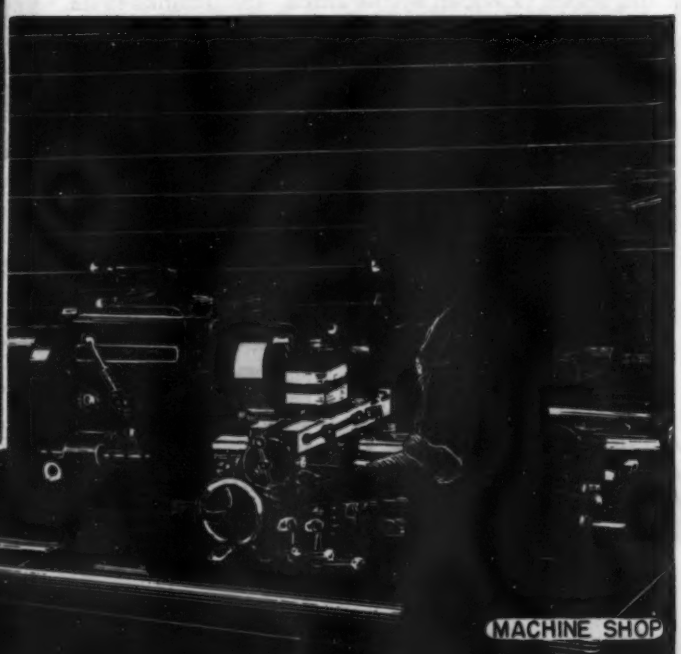


There's a job! Think of the steps involved. First comes engineering with research, for most successful machines are but the sum of previous efforts—plus improvements. Then a pilot model moving through experimental . . . but we are getting ahead of ourselves.

What we mean to tell you in this ad is that VARD INC. can build units like a Sextant from the drawing board to the finished model in quantity production and never go ourside our own plant for anything except raw materials.

Getting back to the pilot model . . . we'd probably make several in experimental with very little tooling. After the design was thoroughly "shaken down," the item would be tooled for production in quantity. We would make a wood pattern for the chassis of the instrument, mould it in sand, and cast it of an aluminum alloy. Other parts would be cast in permanent moulds. Some parts would be stamped.

FOUNDRY


MACHINE SHOP

Inside the Sextant would be gears and ground parts, precision mirrors, and optical glass parts. There would be accurately machined and engraved dials, etc., of metal and plastic. We can do all that.

To make the instrument look right, and stand the weather, its parts would require anodizing, plating, and enameling. We do that, too!

Next, we'd make a wood, plastic, or metal carrying case. And finally—very important—we'd test the Sextant mechanically and optically—on our own equipment.

GEAR CUTTING

OPTICAL GRINDING

In all the hundreds of different operations necessary to complete the pilot models, we have the men and tools to do the job. But here's the thing that makes VARD INC. unique on the Pacific Coast, we also have the equipment and organization that can turn out Sextants in production.

We have the skill accumulated in the production of thousands of aircraft hydraulic and geared parts, navigation instruments, inspection gages and production tools.

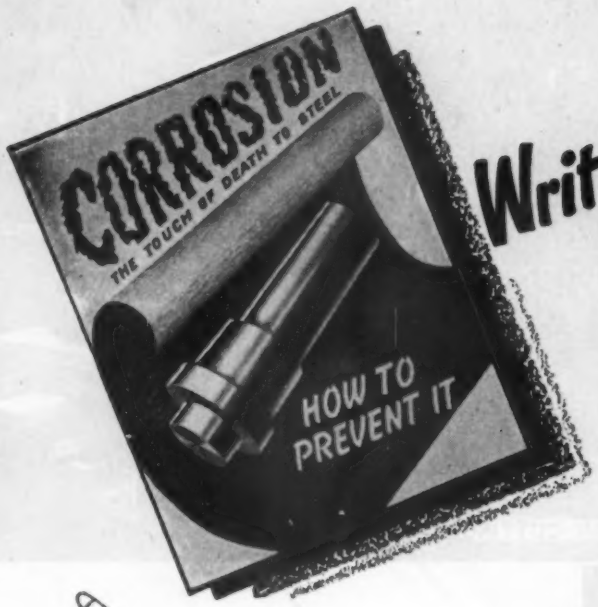
If you don't happen to want us to design and build Sextants for you—what do you have that you want to produce in the West—now or after it's all over?

Center your Responsibility and Save Supervision, Time, and Costs!

VARD INC.

PASADENA 8, CALIF.

...read & Plug Gages • Snap Gages (VARD or JOHN-SONS Type) • Special Taps • Precision Ground Optical Lenses & Filters • High Fidelity Mirrors



Write for this FREE FOLDER!

IT TELLS HOW TO LICK THE MENACE OF CORROSION

With ANGIER INDUWRAP*—Inhibitive Dual Wrapper—you can fight corrosion and win. You can prevent it entirely—kill its causes before they begin their deadly work.

This has been demonstrated over and over again by many leading manufacturers of oil-slushed airplane engine and other polished and finished metal parts shipped to all of the war fronts of the world.

Anticipate now your peacetime needs when ANGIER INDUWRAP will be generally available to industry.

Investigate INDUWRAP.

*Registered U. S. Patent Office

ASK FOR FREE FOLDER AM
"The Touch of Death to Steel"

ANGIER CORPORATION FRAMINGHAM, MASS.
CORROSION PREVENTIVE AND WATERPROOF PAPERS

Angier

"SPECIALS"

MADE TO YOUR SPECIFICATIONS

REED GROUND & LAPPED
KNURLS

We specialize in designing and manufacturing special knurls to meet your individual specifications.

More than 100 Standard Styles and Sizes IN STOCK. Available in either Carbon Steel or High Speed Steel.

Send for New Catalogue No. 62

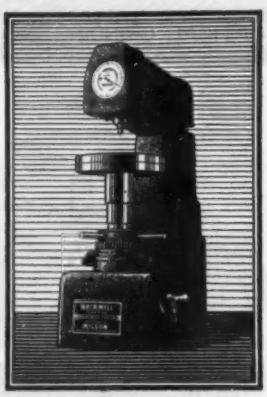
REED SMALL TOOL WORKS
WORCESTER 2, MASSACHUSETTS

"ROCKWELL" HARDNESS TESTER

These new improved type testers available from stock.

Made Only By

WILSON
MECHANICAL INSTRUMENT CO. INC.
Concord Ave., New York 54



HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

TIPS for Lathe and Grinder CENTERS made of COLMONOY No. 6

In addition to supplying COLMONOY Center Tips, we are now in position to provide complete retipping service on centers.

This service consists of casting tips of COLMONOY NO. 6 and applying them to your centers by the use of Silver Solder or a low temperature brazing alloy. By the use of this method your worn or used high speed steel centers can be salvaged, and such reclaimed COLMONOY tipped centers will outlast and outwear new, untipped centers.

Charges for this work are moderate. Prices of tips and the costs of application are given in Bulletin CT-1, which will be mailed on request.

WRITE FOR
BULLETIN CT-1

General Catalog Describes other Colmonoy products.

WALL · COLMONOY CORPORATION

720 Fisher Building · Detroit 2, Michigan

BRANCH OFFICES AT NEW YORK CITY · MADISON, N. J. · CHICAGO · TULSA · LOS ANGELES · SAN FRANCISCO · and in Canada

MODEL K. L. "Blount"

Another New Contribution to the Polishing Field

This recent addition to the Blount line is an overhang type, variable speed machine which provides a wide field of utility and which can be depended on to save time on finishing operations.

A speed indicator shows the exact spindle speeds at a glance. Speeds can be instantly changed while the motor is running. Spindle is suported on two deep groove ball bearings in each housing extensions and can be depended on for accuracy and smooth, vibration-free performance.

Other features include: flanges turned all over; threads milled; spindle of high carbon steel, carefully turned and ground; spindle lock to hold spindle while removing wheels; spindle bearings carefully labyrinth sealed to assure grease tightness; heavy cross-sectioned, smoothly contoured pedestal base.

Write for further details as well as for the complete Blount Catalog.

J. G. BLOUNT CO.
Everett, Mass., U. S. A.

Overhang Type Variable Speed BUFFER and POLISHER

CONDENSED SPECIFICATIONS

Speed Variation: 1100 to 3000 R.P.M.
Motor: 1750 R.P.M. standard ball bearing
Sizes: 3HP., 5 HP., and 7½ H.P.
Overall Spindle length—55¾"
Spindle extensions (each side): 14½"
Size Base: 33½"x23½".
Equipment: Magnetic starter with overload and low voltage protection, with remote push button control.

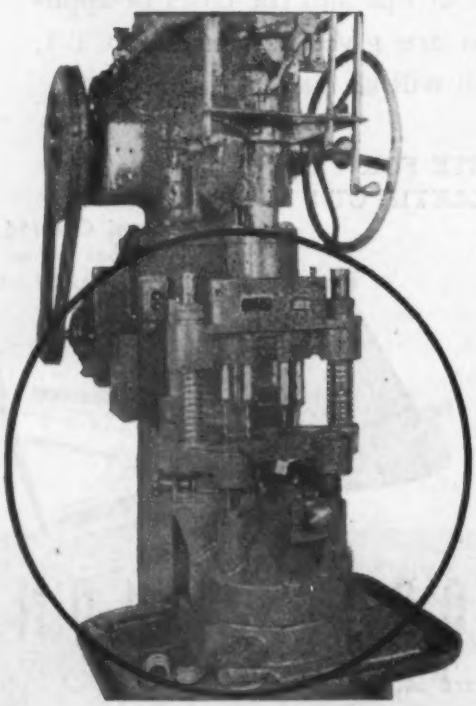
Buhr CLOSES THE GAP

ON A

STANDARD DRILL PRESS

WITH A

COMPLETE TOOLING



4-Spindle BUHR drill and ream Head with vertical adjustment in spindles Bushing Plate.

3-Place Holding Fixture mounted on a 14" Hand Index Table for drilling and reaming 2 holes in Connecting Rod Cap.

BUHR MACHINE TOOL CO.

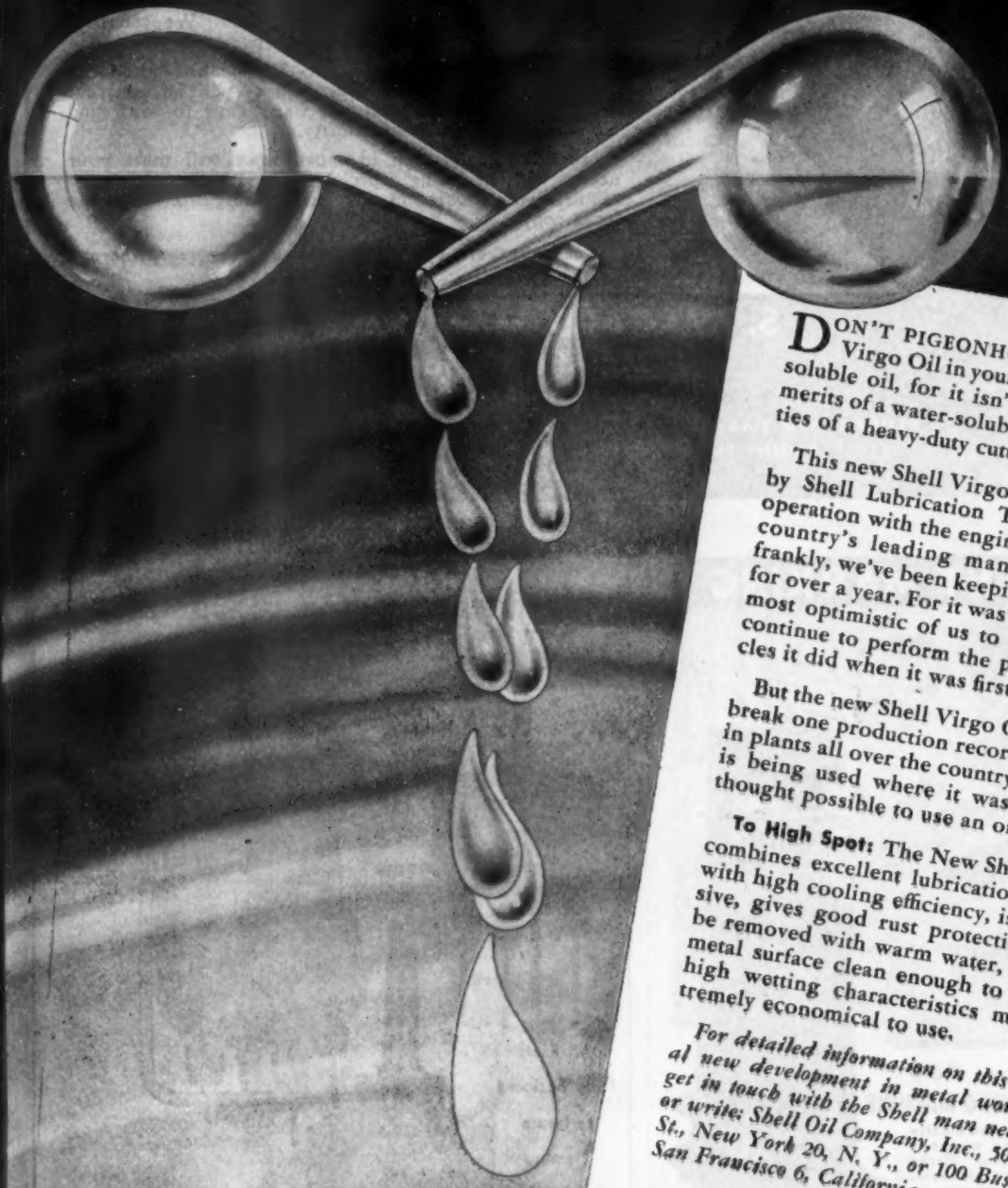
833 GREEN ST. ANN ARBOR, MICH.

SPECIALISTS IN MULTIPLE SPINDLE DRILLING, BORING, REAMING, TAPPING EQUIPMENT

NOW

A SENSATIONAL NEW CUTTING OIL THAT'S

WATER SOLUBLE!



DON'T PIGEONHOLE this new Shell Virgo Oil in your mind as just another soluble oil, for it isn't. It contains all the merits of a water-soluble oil, plus the qualities of a heavy-duty cutting oil.

This new Shell Virgo Oil was developed by Shell Lubrication Technicians in cooperation with the engineers of one of the country's leading manufacturers. And, frankly, we've been keeping it under wraps for over a year. For it was hard for even the most optimistic of us to believe it would continue to perform the production miracles it did when it was first developed.

But the new Shell Virgo Oil continues to break one production record after another in plants all over the country. This new oil is being used where it was never before thought possible to use an oil of this type.

To High Spot: The New Shell Virgo Oil combines excellent lubrication properties with high cooling efficiency, is non-corrosive, gives good rust protection and can be removed with warm water, leaving the metal surface clean enough to paint. The high wetting characteristics make it extremely economical to use.

For detailed information on this sensational new development in metal working oils, get in touch with the Shell man nearest you, or write: Shell Oil Company, Inc., 50 W. 50th St., New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

SHELL

A NEW **SHELL VIRGO OIL**

CARD TAPS

ARE YOU INTERESTED IN BETTER TAPPING?

If better production tapping is your objective, it will be to your advantage to come to Card. We can help you because we sell better tapping performance.

The high quality of work done—the quantity produced—the economy of using Card Taps—will be apparent on any tapping job. Just put Card Taps to work and let them prove their superiority.

A regular catalog tap in most cases will meet your needs without using special taps. You'll find your requirements covered in the Card Catalog No. 34. Write for a copy.

Card taps are sold by leading dealers everywhere

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO

STORES: New York: 61 Reade St., Chicago: 11 South Clinton St. Detroit: 6540 Antoine St., Seattle: 568 First Avenue, South Los Angeles: 168 South Central Avenue San Francisco: 121 Second St.

PERMANENT MARKING

. . . with Matthews 204
GENERAL PURPOSE MARKING MACHINE

Any desired lettering or design clearly and permanently marked on your products with this machine. Marks parts up to 6" in diameter or thickness. Furnished in hand operated, pneumatic and motorized models.

Write for literature today.

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Branch Plants
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ERRINGTON
STAPLETON, STATEN ISLAND, N. Y.
MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads
Fixed-Center Auto-Reverse Multiple Tapping Heads
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

Give "Green Hands" Blue Flash Performance

Here's help for "newcomers" . . . cut-off wheels that compensate to the fullest possible extent for workers' undeveloped skill... wheels that cut clean, free and straight with minimum amount of burr and burn ... wheels that weather rough treatment.

Train "green help" to recognize features that add finesse to the quality of their work. With Bay State resinoid-bonded, rough-sided cut-off wheels, they get freer cutting action, longer life. Discoloration and heat are minimized because contact surface area is noticeably reduced.

Bay State makes wheels for every type of cut-off machine... rubber-bonded wheels for wet operations, resinoid-bonded wheels for dry. Constant rigid laboratory inspection of raw materials . . . modern ovens with delicately-set temperature regulators... and other factory refinements contribute to the mounting reputation for leadership of Bay State "Blue Flash" cut-off wheels just as they do for Bay State's complete line including all types of grinding wheels and other molded abrasive products. Bay State's reputation for honing and superfinishing stones is unexcelled.

Test a wheel to see how Bay State quality helps "green hands" and veterans too. For additional details get Bay State's Cut-off Bulletin. Write...

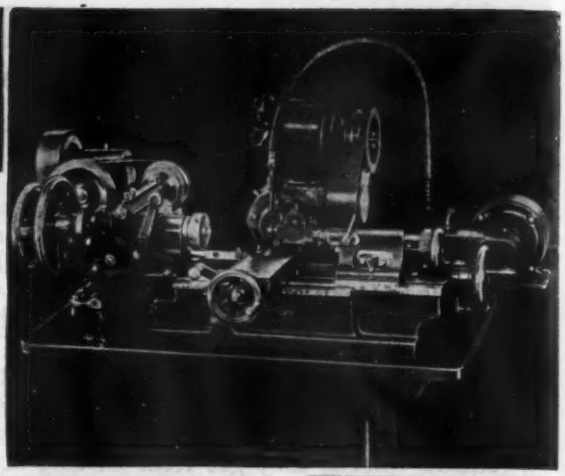
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BAY STATE

BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

WALTHAM THREAD MILLERS
are designed especially for small work requiring close tolerances

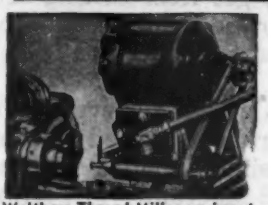


Improvements in the design of these machines involve the use of three motors which provide individual speed change and reverse for cutter and work as well as constant speed for pump. Greater rigidity of cutter head and increased speed range have also been achieved. These machines can be arranged with speeds suitable for either brass or steel and by changing ratios can be used for both.

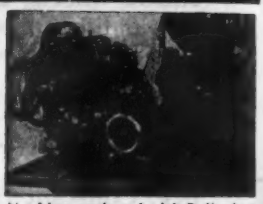
Standard equipment includes machine mounted on cabinet base, motors with push button start and automatic or push button stop, follow rest, milling cutter, and indexing device for cutting multiple threads.

SPECIFICATIONS

Swing over carriage 3"
Capacity (Diameter of work) 2" or smaller
Thread length (work held on centers) 8¾"
Thread length (work held in spring chuck at one end) 10"
Diam. hole through spring chuck ⅝"
Dia. hole through work spindle ¾"
Floor Space 48" x 34"
Motors: 1/3-1/4 and 1/6 HP



Waltham Thread Miller equipped with Internal Threading Attachment



Machine equipped with Relieving Attachment

Send for literature giving complete information.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

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NEW PRODUCTS—FOR POSTWAR MANUFACTURE AND DISTRIBUTION

A nationally known company founded in 1900 with modern factories and sales offices, strategically located in the United States, desires new products for manufacture and distribution after the war. If you have a recently patented or patent-applied for sound peacetime item, embodying new basic features or improvements — or, if you wish to dispose of a "going business" including the right to manufacture and sell the type of products desired, we would like to hear from you. If you are interested, write giving full information. All communications will be held in strict confidence. Direct your letter care this magazine.

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Vascoloy RAMET

TANTUNG CUTTING TOOLS — DIES

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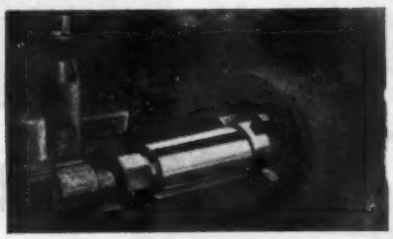
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

★ *Modern, Versatile* **NICHOLSON**



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Two types. All sizes. Sold singly or in sets. Prompt delivery. Bulletin No. 1043.

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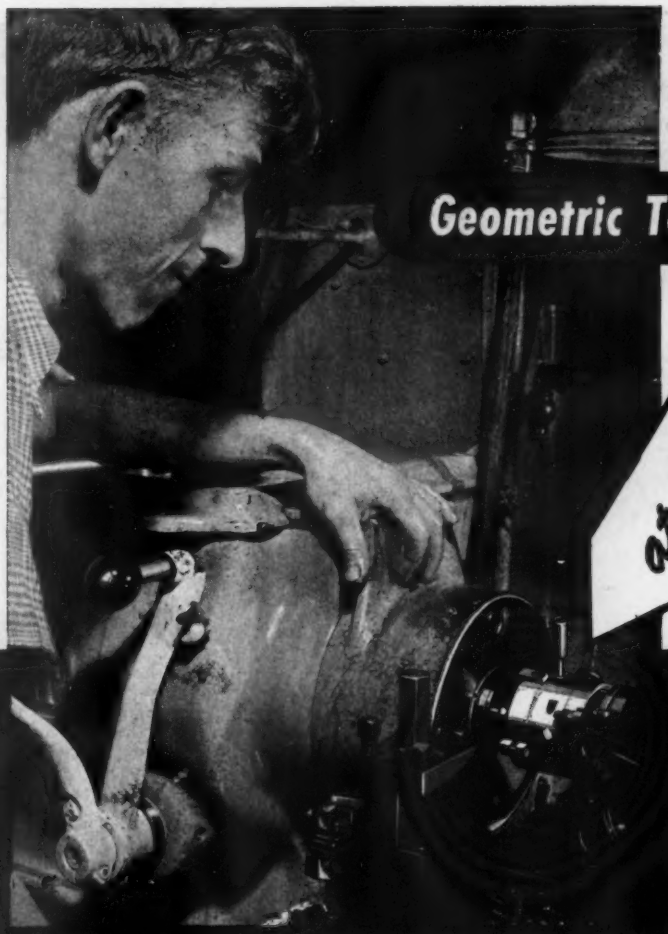
Other Products: Arbor Presses, Control Valves, Steam Traps, etc.



Geometric Tools AT WORK at Lockheed

Aircraft specifications are exacting — GEOMETRIC Tools meet them!

This Geometric Die Head (above)—doing a threading job in the Lockheed Aircraft Corporation plant—is typical of many other Geometric Tools helping plane manufacturers combine high production with the precision results so imperative on aircraft work... Geometric Die Heads and all the other tools in the complete Geometric line combine these advantageous features that assure closest accuracy: Every major part made of special alloy steel, hardened and tempered all the way through... Quick, easy, accurate chaser adjustment; rigid chaser support... Easy shoulder threading with regular chasers... All working parts fully protected... All Die Head chasers checked—and re-checked in actual use—for thread form, lead, taper and hardness. Write for data, outlining your threading requirements.

A Geometric EJ5 Die Head used for producing extremely small, fine threads. Geometric Die Heads are producing external threads from 1/16" to 6" dia., from coarse to as fine as 80 per inch.

for saving Precious Chasers

Keep fine oilstones of various shapes for touching up chamfers and faces occasionally. This removes fine burrs thrown up in grinding, eliminates over-keen edges, increases time between grinds. But don't fail to sharpen chasers as soon as dullness appears!

GEOMETRIC TOOL COMPANY

★

Machinery and Tools for cutting Screw Threads

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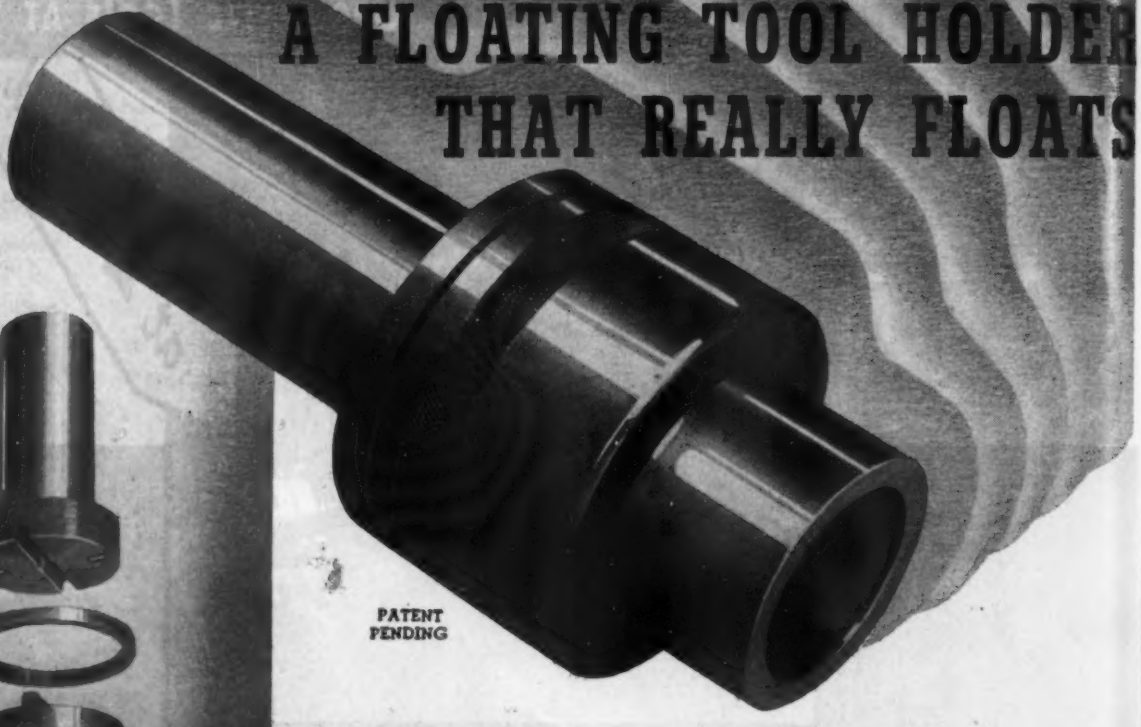
NEW HAVEN 15 CONNECTICUT

At Last!

A FLOATING TOOL HOLDER THAT REALLY FLOATS



ONLY 5 PARTS

1—SHANK
2—ADJUSTABLE NUT
3—UNIVERSAL FLOAT
4—BODY (CAP)
5—SLEEVE

EVERY HOLE—STARTING WITH THE VERY FIRST ONE YOU REAM—WILL BE ACCURATE TO SIZE—PERFECTLY ROUND

Here is indeed an outstanding floating tool holder! Its simplicity of design—a coordination of only five parts—bespeaks its high efficiency.

It will compensate for both off-center and out-of-parallel misalignment—permits the float to be adjusted in all directions.

The moving parts ride on rollers and thus contribute immeasurably to making the members antifriction—producing smoother running with more perfect alignment.

Composed of only five parts, the Empire Floating Tool Holder requires a minimum of maintenance—nothing to get out of order. Nor is there anything to fall out or get lost when holder is taken apart.

It will enable you to ream holes with close tolerances with the very first hole reamed to size.

You will definitely have no more bell-mouthed holes if you use the Empire Floating Tool Holder.

Floating Tool Holders are available with holes in sleeves in the following sizes: ⅜", ½", ⅝", ¾", 1", 1¼", 1½", in choice of shank diameters: ⅜", ¾", 1", 1¼", 1½", 1¾", 2", 2¼".

Send for catalog and price quotations on your specific requirements.

TRY ONE OF THESE STANDARD HOLDERS FOR 30 DAYS.
If you're not thoroughly satisfied, return it for full credit.

The Blades That Reduce Friction

EMPIRE Tool Co.

8778 Grinnell Ave.
Detroit 13, Mich.

How these Tool Steels reduce tool-room problems

Although Bethlehem manufactures a number of different tool steels, the group known as the Big 8 is suitable for a great majority of applications . . . in fact, these eight grades can be used on 97 per cent of your tool-steel work. At the right are their names and the type of work each one does.

By standardizing on Bethlehem's Big 8, a shop can reduce the *number* of tool steels carried in stock. This, in turn, simplifies heat-treating problems. Moreover, the final results—in terms of finished products—will equal or even surpass those obtained by working with a larger number of grades.

There is another advantage, too. Using these few specialized steels, both the tool room and the heat-treating department can readily familiarize themselves with the properties of each individual type.

You can put these tool steels to work with the assurance that every one of them is a tried-and-true campaigner, *for all eight are back on prewar analyses.* A Bethlehem engineer will be glad to explain their various qualifications.

CARBON TOOL STEEL (water-hardening). For an almost endless list of dies, cutting tools, punches, etc.

TOOL ROOM (oil-hardening). For dies, punches, broaches, hobs, drill bushings, forming tools, gauges, and similar tools.

OMEGA (oil-hardening). One of the best of all shock-resisting steels. For cold-battering tools and machine parts subject to shock.

No. 67 CHISEL (oil-hardening). Primarily for battering and shock purposes—both hot and cold work. Also master hobs.

AIR-HARDENING. Another famous die steel—air-quenched, as the name implies. Develops a hardness comparable to that of liquid-quenched die steels.

LEHIGH DIE and TOOL, H Temper (air- or oil-hardening). Recommended where minimum deformation in heat treating is required. A steel for maximum production.

No. 57 HOT WORK (oil- or air-hardening). Especially suitable for tools that will work both hot steel and other hot metals.

No. 66 HIGH SPEED (oil-hardening). A general-purpose high-speed cutting steel with excellent red-hardness.

BIG 8 BETHLEHEM STEEL **HANDLE 97% OF TOOL STEEL JOBS**

IMPROVES CLEANING . . . *Cuts Rejects*

SUN SPIRITS

Eliminates Rust . . . Cleans Castings Thoroughly

With speed so essential to our war program, delays cannot be risked in any plant. For every hold-up on the production line takes a drastic toll on vital man-power and time.

Trouble from rusting was a major problem in one plant and occurred in the cleaning of castings after machining. The operation was a difficult one at the start.

Sun mineral spirits were used, at the recommendation of a Sun Doctor of Industry. The cleaning was satisfactory in every respect . . . rusting has been checked . . . parts are cleaned thoroughly and quickly.

Rejects have been reduced, drastically, and their production increased due to the saving of material, man-power and time.

Sun Spirits has proved itself time and again in meeting the needs for the majority of cleaning jobs in any plant. It's fast, thorough, economical and safe, having the approval of the Fire Underwriters at 100° F. flash.

For more detailed information, write for your free copy of "Case Histories of Cleaning Up War Parts."

SUN OIL COMPANY • **Philadelphia 3, Pa.**

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*

New SPEED...
New PRECISION
FOR SMALL THREADED WORK

THE ECONOMIES of the Circular Chaser principle—exclusive with National Acme—are now available to producers of small threaded parts, with the new

NAMCO "DA"
SOLID ADJUSTABLE DIEHEAD

With only three parts, simple and rugged in construction, this die handles work from .056" to .1875" in diameter, pitches 80 to 20.

One adjustment brings all chasers to fine diametric precision, and they hold to the rigid standards of Class 3 threads. Chasers may be reground through 270° circumference—they last 20 to 50 times longer.

If you cut small diameter threads, the new "DA" is the tool you need. Catalog D 42-A.

Style "DA"
.056-.1875"

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

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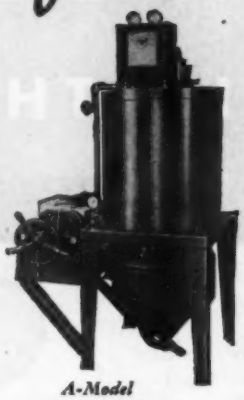

A-Model

Wartime industry more and more is depending upon YM Refiners to to *save oil!* YM restores used oils to new oil values of viscosity, fire and flash, neutralization number, precipitation number, emulsion test, etc.—for aircraft engine drainage, hydraulic oils, or other types of lubricating oils. Today's largest builder of air-cooled engines and the largest builder of liquid-cooled engines use YM Refiners! Also, widely used by other concerns for salvaging hydraulic or lubricating oil. Write today . . . advise the oil quantities available each week.

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For Lubricating and Hydraulic Oils

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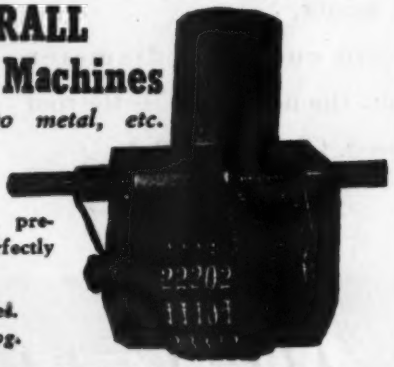
Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

NUMBERALL Numbering Machines

for stamping into metal, etc.

AUTOMATIC
MODEL NO. 50



Sturdy construction, precision build, perfectly aligned numbers.

All sizes of figures.
Write for Catalog.

NUMBERALL STAMP & TOOL CO.
Huguenot Park, Staten Island, N. Y.

There is Certainty of Satisfaction
IN SAFCO CUTTING OILS AND COOLANTS

Tool Life Increased 33% with Safco 560

The superintendent of a midwest plant, manufacturing electrical coils, consulted a Swan-Finch Service Engineer on the selection of an oil for use in the milling of zinc die-castings. After inspection of the operation, SAFCO #560 was recommended.

SAFCO #560 immediately bettered the performance of the soluble oil previously used on this job. It made possible an increase in feed of 50%, and increased the tool life by 33%, producing an exceptionally smooth, bright finish.

KoldKut 1500A Steps Up Cutting Speed 50%

An Ohio plant recently tested SAFCO KoldKut 1500A against the performance of the oil they had previously used. The test operation consisted of turning, forming, drilling, boring and cutoff of SAE 1020 and heat-treated SAE 4130 steels, using an automatic screw machine and high speed steel tools.

Results obtained from the use of KoldKut were above their expectations. The tool life was increased from 3 to 10 hours... cutting speed was increased 50%. These combined advantages of KoldKut 1500A assured greater production on the job, and operators liked KoldKut 1500A because of its light color and low viscosity, which permitted it to drain more readily from the chips and parts.

Scores of actual plant records like those above attest to the outstanding performance characteristics of SAFCO Cutting Oils and Coolants. Better results, however, are not the only advantages you may expect as a Swan-Finch customer. Of almost equal importance is the skilled training and experience which the Swan-Finch Service Engineer places at your disposal... experience invaluable in the selection of the proper oil for a specific purpose. This is the point at which improved cutting oil performance really begins... and results in your own plant will prove the wisdom of seeking expert counsel in cutting oil problems.

Certainty of satisfaction too, is assured by the Swan-Finch sales policy, which underwrites your realization of improvements promised by SAFCO products. Its operation is both simple and straightforward. Merely ask a Swan-Finch Service Engineer to recommend a SAFCO Oil for testing on any machining operation in your plant. Test it ... under average plant conditions... judge the results for yourself. If you are dissatisfied, in any respect, with results obtained from any SAFCO Oil... *we'll cancel the invoice for your test drum!*

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THE NEW

20" QUEEN CITY *Super Twenty Shaper*

ASSURES GREATER OUTPUT... BETTER FINISH

The latest in shaper design and efficiency, the new Super Twenty Shaper offers many advantages both in quality and output not available in older models. This new shaper is highly adaptable to a wide variety of work, from the heaviest roughing to the finest precision tool room work.

The ram is of the V-type of wide bearing; the clutch is the dry multiple-disc type, requiring minimum attention. The feed range is extremely versatile — from .008" to .191" — easily, quickly changed. A high torque motor for the power rapid traverse is standard. An electrical limit switch in the rail offers complete motor control. Timken Bearings are used throughout.

For top performance, speed, versatility, accuracy, and unusual economy, this Shaper will meet with your entire satisfaction. *For full details, write Dept. AM. Agents in principal cities.*

QUEEN CITY
MACHINE TOOL Co.
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THIS CHUCK assures accurate centering and positive drive of taps

It's an Ettco-Emrick VISIBLE GRIP TAP CHUCK

This is one of the Ettco-Emrick High-Speed, Sensitive Tapping Attachments equipped with the Visible Grip Tap Chuck. Attachments come in 7 sizes for No. 0 to 1" taps. Can be used on any drill press. Hair-trigger sensitive friction clutch makes tapping easy. If you want full details, ask for BULLETIN No. 2.

Here's how. **First, the shank is centered on the round by tightening the knurled nut.** Then the chuck's powerful floating jaws are clamped on the drive square by tightening with the key. And you can be sure that the square is properly clamped every time because you can see the grip through the opening in the chuck provided for that purpose.

For round shank drills and other tools, just grind a flat on one side and this chuck will hold them as accurately and securely as taps.

Ettco-Emrick Visible Grip Tap Chucks come in 5 sizes for No. 0 to 1" taps. You can get them with taper holes for standard taper shanks or arranged to fit screw machine releasing tap holders, quick change collets, or the spindle of practically any other machine or with straight shanks for turrets of hand screw machines.

WRITE FOR BULLETIN No. 6

It gives full details of these common sense, universal tap chucks. Copy mailed on request. Write for yours today.

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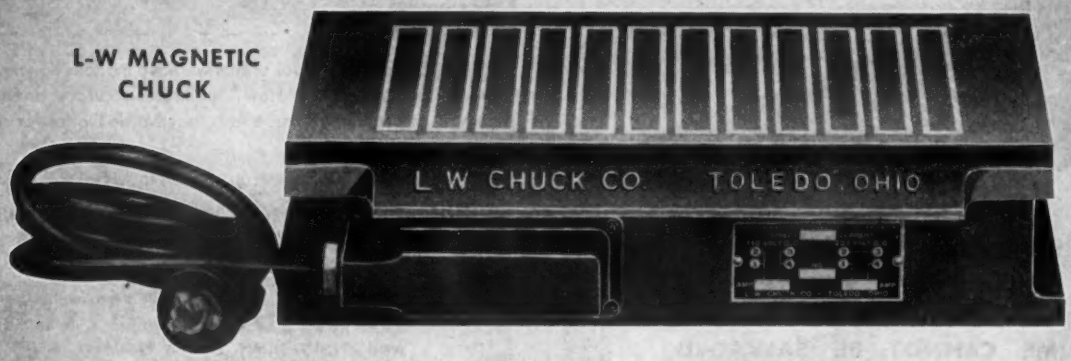
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS

MAGNETIC CHUCKS

. . . guaranteed maximum magnetic holding power, constructed for long life, water-proof for wet or dry grinding. These features plus scientific design and highest grade materials are your assurance that L-W Magnetic Chucks will properly fill all requirements . . . meet any demands. L-W Magnetic Chucks are built in four sizes, supplied with connections to operate on either 110 or 220 volt D. C.

L-W MAGNETIC CHUCK



L-W

RECTIFIER, converts A. C. into D. C., for use on magnetic chucks. A. C. input 110 volts. D. C. output 110 volts, 8 amps. Suitable for use with our 5¾ x 13 and 6½ x 18 magnetic chucks . . . Price **$25.00.** Larger capacity rectifiers available.

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Working Surface 10¾" wide, 37" long	$202.05
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Field Discharge Type $16.25
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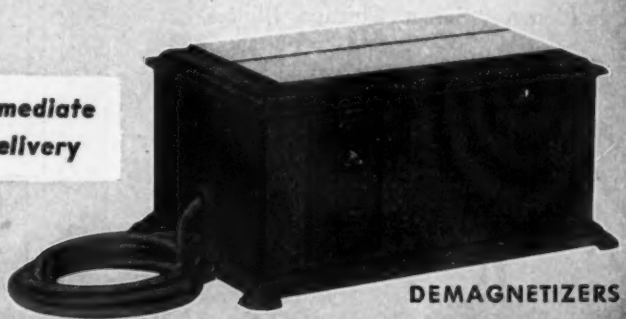

DEMAGNETIZERS

A new catalogue is available . . . send for your free copy today!

L-W CHUCK COMPANY

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Also manufacturers of LATHE CHUCKS • DIVIDING HEADS • MILLING MACHINE VISES • POWER HACK SAWS

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TIME CANNOT BE SALVAGED

Once it's gone there's no reclaiming it. But you can cut your finishing time 'way down with Haskins Flexible Shaft Equipment. Forget old hand-finishing methods. Your men will work faster and better, with less fatigue, the Haskins way. Every hour will see increased production. Man-hours—plus machine-hours—will really mean something. For important new time-saver methods, send for your copy of Catalog 45. R. G. Haskins Company, 2760 W. Flournoy Street, Chicago, Illinois.

H-6

1/2 H.P. Countershaft drive, 4-speed —900—3400 R. P. M. Bench height pedestal mounting, 360 degree swivel.

HASKINS
Flexible Shaft
EQUIPMENT

More VERSATILE machines for More PROFITABLE Work

For your special cutting tool orders we have modern equipment, skilled workers and the "Know How" to insure accuracy and fine workmanship. At present we can offer attractive deliveries for all types of cutting tools.

Send your inquiries for special cutting tools to A. C. E. Bulletin on request.

AMERICAN CUTTER & ENGINEERING CORP., 31745 Mound Road, Warren, Mich.

AMERICAN CUTTER
AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

GRINDING WHEEL DRESSERS

Desmond Cutters *Desmond Hex Dresser*

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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URBANA, OHIO
Canadian D-S Mfg. Co., Hamilton, Ont.

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DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates

simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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Macklin Wheels
will grind your welds
fast and efficiently.

MACKLIN CO. JACKSON MICH. U.S.A.
PROTECT YOUR PRODUCTION

MACKLIN HIGH QUALITY WHEELS
FOR EVERY GRINDING PURPOSE WILL
"PROTECT YOUR PRODUCTION"

Ask for
the services of
a Macklin Field Engineer

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

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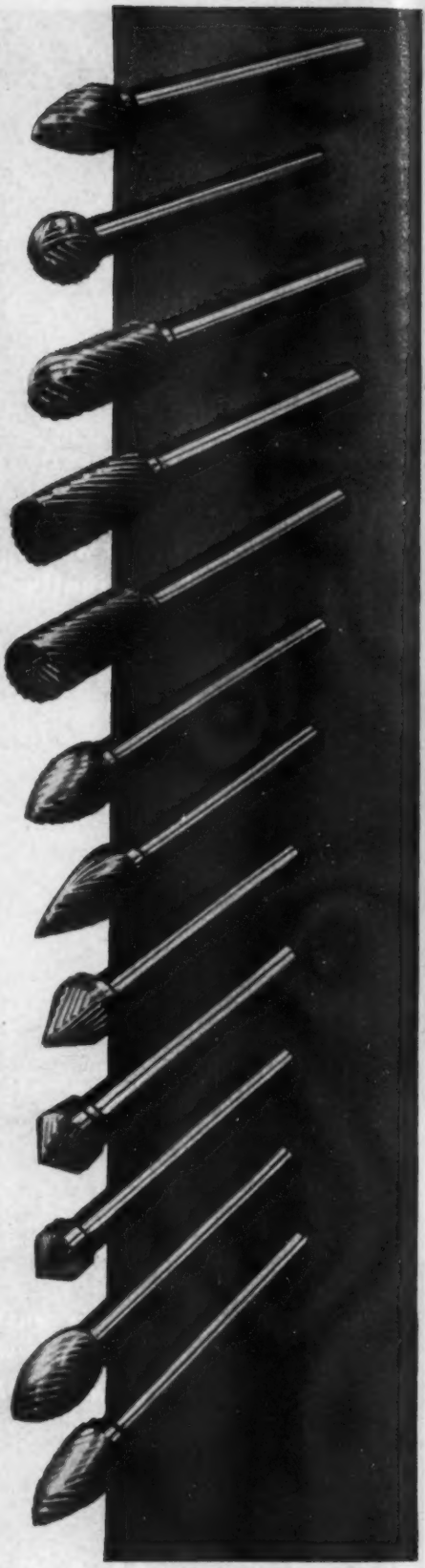
These are the Present STANDARD SHAPES of CARBURS

INDUSTRY'S FIRST CEMENTED-CARBIDE ROTARY FILES

EACH of the tools illustrated is available in either four or five sizes—providing a range that meets almost any production requirement for deburring, filing or cutting. In addition to these, special shapes are being produced to meet the specific needs of many customers.

Since Carburs were first introduced, a number of performance reports have been received from the plants where they have been in constant use. These reports prove that these rotary files—which have teeth ground from the solid cemented-carbide—are providing up to 100 times greater life than high speed steel files. They are greatly reducing deburring, filing or cutting time per part because of the higher speeds at which they can be run and the less frequent need for replacement. Another important feature noted is that tool sharpening is reduced in proportion to the life of the tool.

You, too, will recognize these and other advantages once you have used Carburs in your production. Prompt delivery on all standard shapes and sizes can now be promised. Let us send you full information.



LINCOLN PARK—WHERE THE *"Impossible"* IN PRECISION IS ACHIEVED

ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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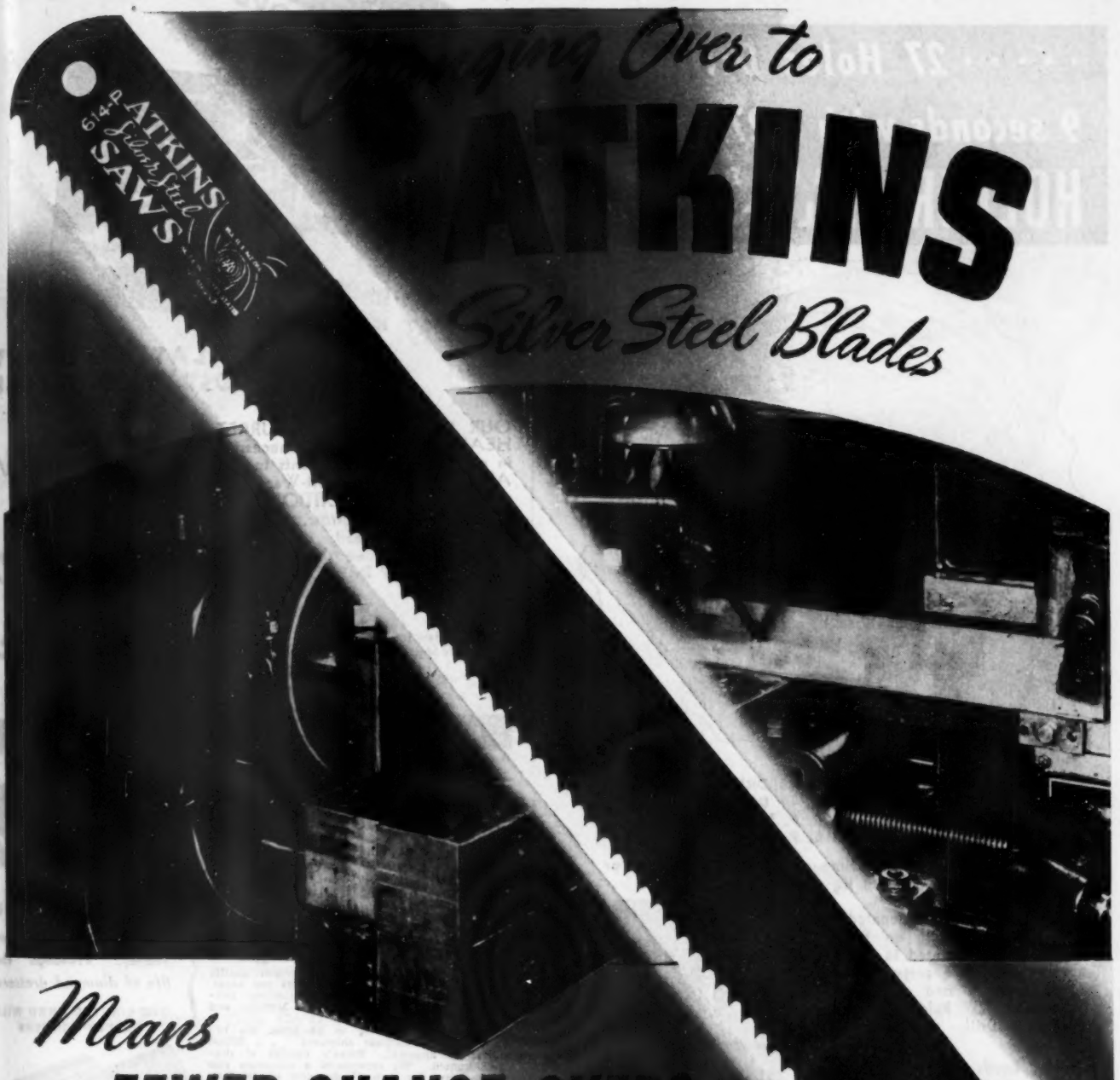
Changing Over to

ATKINS

Silver Steel Blades



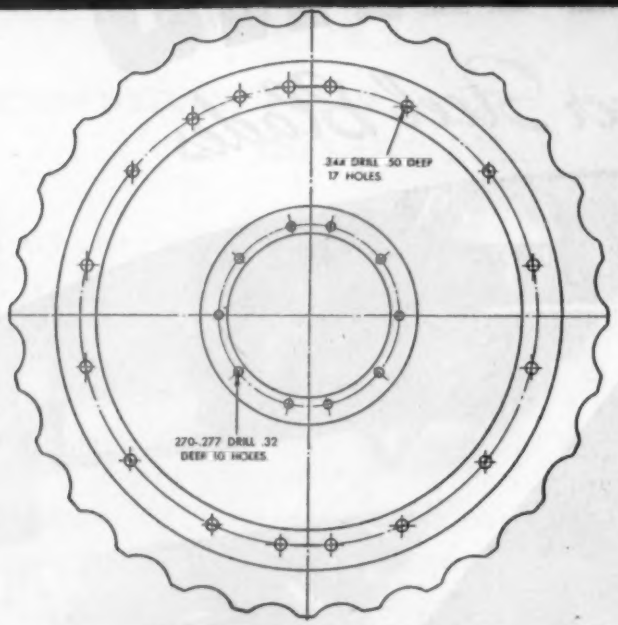
Means FEWER CHANGE-OVERS ON MACHINES

● Tool change-overs are one of those "necessary wastes". Expensive machines stand idle, valuable workers mark time, production stops while a worn tool is replaced. The responsibility for holding such "necessary wastes" at rock-bottom is one of the toughest jobs plant men face. For thousands, this problem has resolved itself into using Atkins *Silver Steel* Blades for all metal cutting. These famous blades with the "Blue Ends" have the remarkable endurance of *Silver Steel*—the ability to cut fast over long periods. These are points that Atkins Engineered Cutting Service is prepared to demonstrate in your plant on work of your choosing. Write today for information.

E. C. ATKINS AND COMPANY, 424 S. Illinois St., Indianapolis 9, Ind.

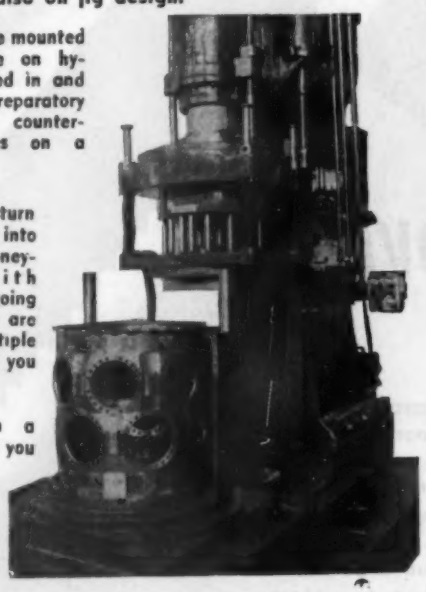
TOOLS ARE WEAPONS . . . TREAT 'EM RIGHT!

····· 27 Holes Drilled in 9 seconds with a 27 spindle HOEFER MULTIPLE DRILLING HEAD



27 HOLES—(10) .270 DRILLS
—(17) .344 DRILLS
50' PER MINUTE—764 R. P. M. .0042" FEED
50' PER MINUTE—555 R. P. M. .006" FEED

Loading and unloading time a human element factor and dependent also on jig design.



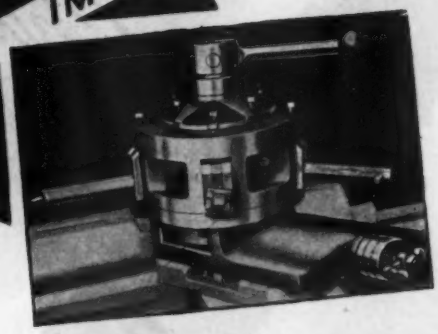
● Shows crankcase mounted in special fixture on hydraulically operated in and out work table preparatory to reaming and countersinking 27 holes on a Barnes Drill.

● Hoefer heads will turn your present machines into high production money-saving equipment. With quantity production going through your shop you are paying for Hoefer Multiple Spindle Heads whether you install them or not.

Consider drilling in a cost-per-hole light and you will be amazed at the opportunity for saving on production costs. We can show you how you can realize these savings with no expensive outlay for new machinery and no additional floor space—just add Hoefer Heads to your present machines. Hoefer Heads pay for themselves by decreasing handling time, lessening operator fatigue, and speeding up production. You can get results similar to the one featured here in the armament work you are now doing. Let us tell you all about it **Hoefer's Whole Business is Holes.**

HOEFER MFG. CO. *Freeport, Ill.*

Our NEW IMPROVED



5 STATION LATHE TURRETS FOR THE POST-VICTORY YEARS

OUR NEW IMPROVED TURRET HEADS are a Vital war-time necessity in machine shops and plants today. Also Vital for your Post-War planning where COMPETITION will be so keen — tomorrow. For the Victory years ahead, order now, equip your machine shop or plant with OUR NEW IMPROVED TURRET HEADS.

5 TOOLS IN POSITION *for* **INSTANT CHANGE**

ALLOWING MINUTE ADJUSTMENTS WITH 10 ACCURATE TOOL POSITIONS

Write Today for Complete Details

AUTOMATIC MACHINE & TOOL CO. ENGINEERED PRODUCTS AUBURNDALE, MASSACHUSETTS

Made up in Four Individual Sizes

332 CHARLES STREET, AUBURNDALE, MASS.

DIAMONDS for Victory

BIG-HED-NIBS
LOC-KEY-SET

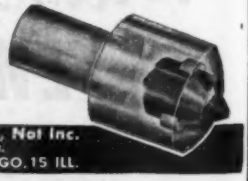
RE-SET-ABLE
Means more for your money. Prolongs the life of diamond dressers.

DISTRIBUTED THRU MILL SUPPLY JOBBERS

● Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. ($4 hour resetting service, $1.00 post paid.) Grinders instruction card free.

The Most Complete and Up-to-the-Minute Line of Diamond Tools for War Production. Send for Free Catalog.



DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
938 E. 41st Street CHICAGO, 15 ILL.

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Consistent Quality

GAGES AND TOOLS

ARTHUR V. CRAFTS COMPANY, INC.

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT · CHICAGO

"I got my choice of two bumper crops!"

Here's not one, but two right answers on how to get more power bits for less!

FIRST, you can use the regular Apex-Phillips screw driver bits, and when they get worn just send 'em back to the factory and have 'em reconditioned. The cost is a small fraction . . . generally less than one-third . . . of the new bit price. AND renewed Apex bits are good as new, which is plenty good, because they're made of fine steel, heat treated for the right combination of strength and hardness. Get the full story in Catalog No. 15.

OR you can use the new Insert Type Apex bits, with Apex holders. Holders are supplied to fit practically every type and make of power driver. And the holders accommodate the short, money-saving, steel-saving bits in a full range of sizes. You trim your inventory because a few bit sizes fit all holders. You save substantial money. Get the facts in Bulletin No. 102. So take your choice, and either way, make it Apex-Phillips screw driver bits.

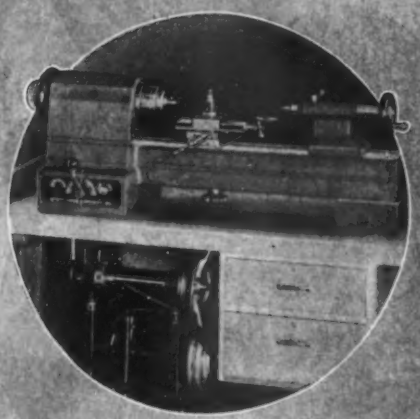
APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON 2, OHIO

RIVETT

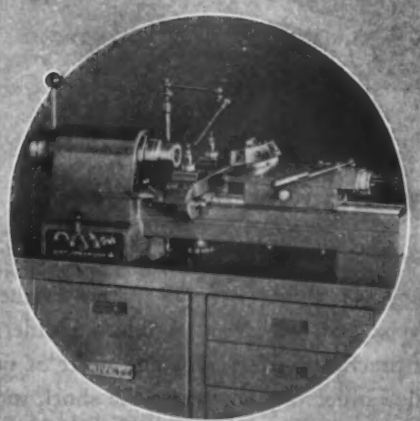
TOOL-ROOM LATHES

RIVETT 608 back-geared, screw cutting lathe is recognized the world over for its ability to produce fine work within guaranteed precision limits. In manufacturing, tool-making and experimental work, it will handle a great variety of parts in minimum time. Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations are available. Swing is 8½" dia.; center distance is 18¼"; collet capacity is 1" max.



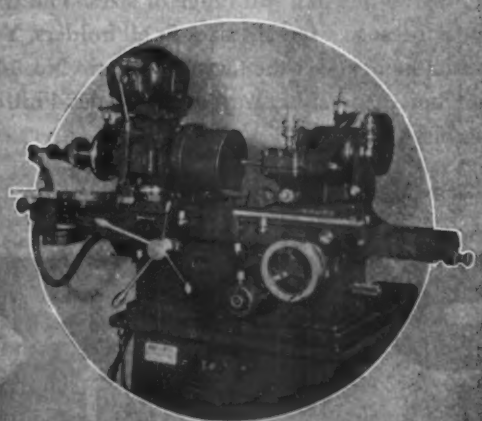
PLAIN BENCH LATHES

RIVETT plain precision bench lathes have vastly increased the earning power of such machines. An engineered unit, a Rivett lathe is quick to set-up, has wide speed range, power and vibrationless performance and is capable of many jobs often produced on heavy, costly machines. Two sizes are furnished: Series 715 has 7" dia. swing, 15" center distance and ¾" max. collet capacity; Series 918 has 9" dia. swing, 18" center distance and 1" max. collet capacity.



HAND SCREW MACHINES

RIVETT 918 hand screw machine incorporates precision, balanced design and operating features to make it an efficient producer on small duplicate parts. Bar stock passed through spindle may be held in push-out collet, while work individually chucked may be held in draw-in collet, step chuck or jaw chuck. In combination with six turret operations, double tool cross slide can be furnished for straight or taper turning, forming or cutting-off. Swing is 9" dia. and collet capacity is 1" max.



INTERNAL GRINDERS

RIVETT internal grinders are primarily designed for tool room work, however, are used extensively in precision manufacturing. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Two sizes are furnished: Series 104 has internal and external grinding capacity up to 3" dia. with power table travel up to 4"; Series 112 has internal and external grinding capacity up to 8" dia. with power table travel up to 8".

Write for General Bulletin 500

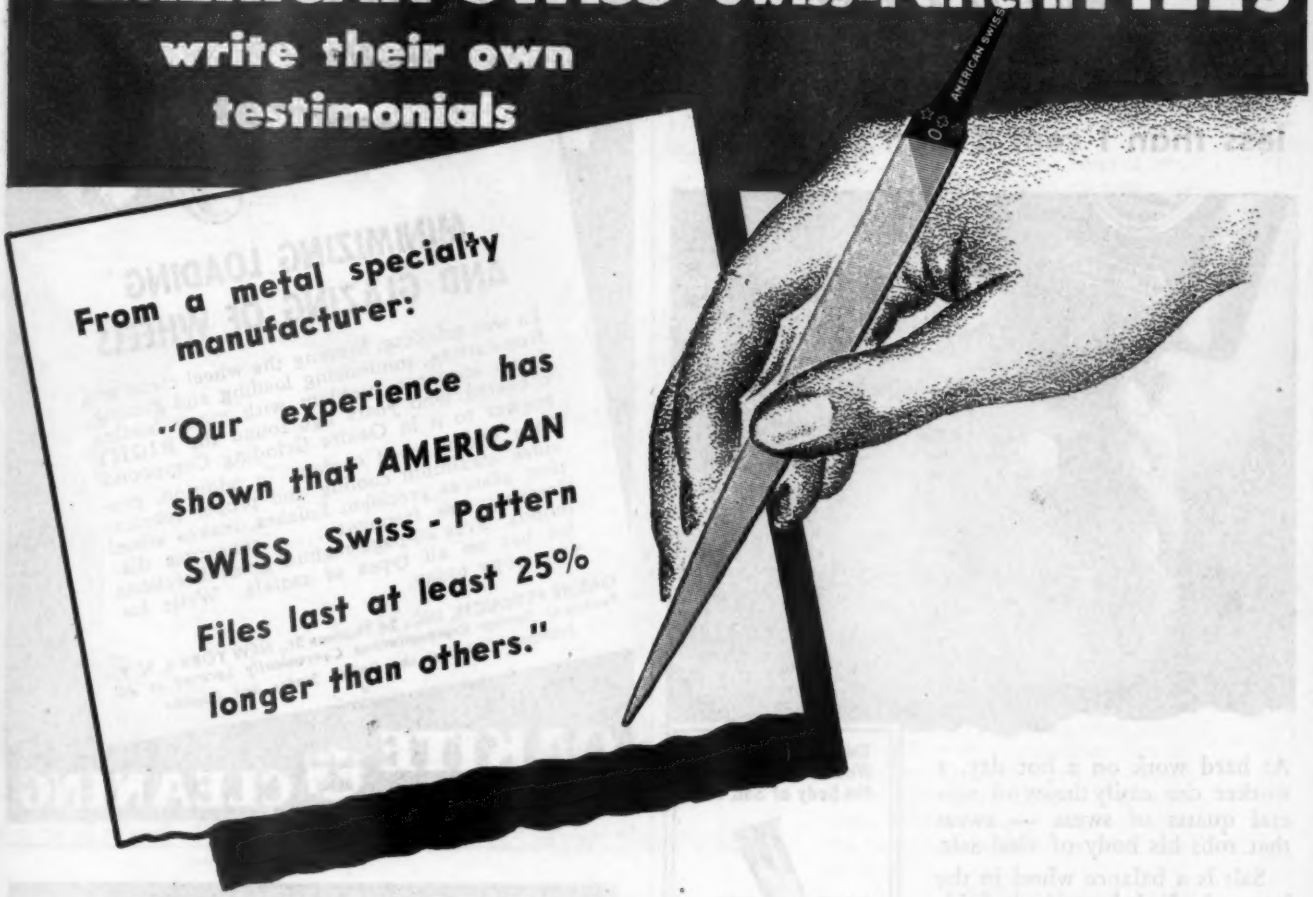
ARMY E NAVY

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

"AMERICAN SWISS" Swiss-Pattern FILES

write their own testimonials


From a metal specialty manufacturer:
"Our experience has shown that AMERICAN SWISS Swiss - Pattern Files last at least 25% longer than others."
AMERICAN SWISS

FREE CATALOG
SENT ON REQUEST

Long life in a file is the result of tough, strong metal . . . correct and uniform hardness . . . sharp, accurately cut teeth . . . long filing surface. All these features are characteristic of AMERICAN SWISS Files . . . as proven by their popularity for almost 45 years.

AMERICAN SWISS Swiss-Pattern Files have always been made to only one standard . . . the best. There are no "second-quality" AMERICAN SWISS Files . . . each one you buy is guaranteed to be perfect in every respect. These precision tools are made by long-experienced specialists, to exacting standards, and with automatic controls and close tolerances.

These are some of the reasons why it will pay you to standardize on the large line of AMERICAN SWISS Files for all your precision and intricate filing work. Our Distributor can supply you.

AMERICAN SWISS FILE & TOOL CO., ELIZABETH, N. J.

ASK FOR THEM BY NAME

American Swiss

SWISS PATTERN FILES

WORKERS *Need Salt-*

Supply it- **this easy, simple way for less than 1 cent a man per week**

At hard work on a hot day, a worker can easily throw off several quarts of sweat — sweat that robs his body of vital salt.

Salt is a balance wheel in the human body. It keeps body fluids in equilibrium. When salt is lost the body is dehydrated and the blood thickens. The result is Heat-Fag, lassitude, inalertness. Production suffers.

Loss of body fluids causes thirst. Water without salt under these conditions, dilutes body fluids and causes heat cramps.

The easy way to replace salt sweated out is with Morton's Salt Tablets. It costs less than a cent a man per week to make them available at every drinking fountain.

Physicians with America's largest manufacturing plants have the figures to show that this cuts down Heat-Fag, heat cramps, heat prostrations. Production stays up. Accidents stay down.

This Is What Happens When Sweating Robs the Body of Salt . . .

QUICK DISSOLVING
(Less than 30 Seconds)

This is how a Morton Salt Tablet looks when magnified. See how soft and porous it is inside. When swallowed with a drink of water, it dissolves in less than 30 seconds.

Case of 9000, 10-grain salt tablets **$2.60**

Salt-Dextrose tablets, case of 9000 - - - - **$3.15**

MORTON'S Heat-Fag SALT TABLETS

Morton's Dispensers

They deliver salt tablets, one at a time, quickly, cleanly—no waste. Sanitary, easily filled, durable.

800 Tablet size - - - **$3.25**

Order from your distributor or directly from this advertisement . . . Write for free folder.

MORTON SALT COMPANY, Chicago 4, Illinois

Is this YOUR Grinding Problem?

MINIMIZING LOADING AND GLAZING OF WHEELS

In wet grinding, keeping the wheel clean and free-cutting, minimizing loading and glazing, is no longer a problem with many leading concerns who years ago found the RIGHT answer to it in Oakite Grinding Compound. This widely used coolant, in addition, provides maximum cooling and proper lubrication, assures precision finishes, makes wheel dressing less frequent . . . conserves diamonds. Free 20-page manual gives directions for use on all types of metals. Write for your copy today.

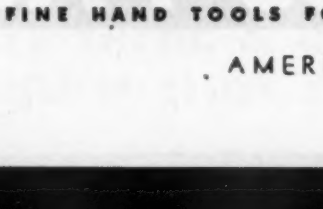
OAKITE PRODUCTS, INC., 24 Thames St., NEW YORK 6, N. Y.
Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada

OAKITE CLEANING

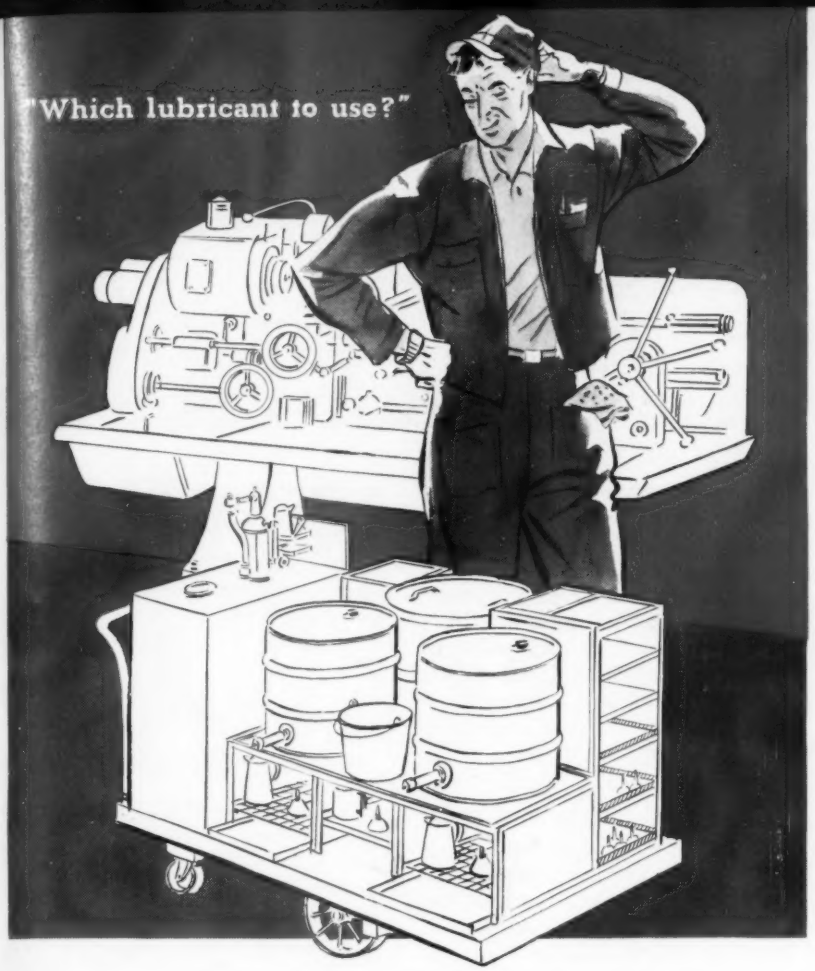
...for better clearance

Here's one of the many Plomb Tools speeding war work. It represents the most compact line of Offset Box Wrenches on the market — covering the greatest number of opening sizes with the minimum number of wrenches — available in both long and short types. . . . Features like this make Plomb Tools the choice of professional mechanics in all industries. You will find the tools you need at Plomb dealers, everywhere.—

Plomb Tool Company
Los Angeles, Calif.



FINE HAND TOOLS FOR ALL INDUSTRIES



Standard Coded Lubrication Service

. . . a definite answer to your oilers' question, "Which lubricant to use?"

The best lubricants and the most careful study of where and how to apply them are wasted unless the *right* lubricant is applied to the *right* spot every time it is needed. Worse than that, when lubricants are misapplied, machines may be damaged, time is wasted repairing them, and production drops off. The men in charge of your lubrication can tell you how troublesome this problem is in your plant—particularly today with new men on machines and oiler crews changing continually.

Misapplied lubricants have been as much of a problem to us as to you. For example, our Engineers may work with your plant men to determine the right lubricant for a certain troublesome application. It is found and works successfully for some time. Then trouble suddenly occurs—bearings go out, and a machine is tied up. Perhaps a new oiler was on the job—his instructions might not have been clear—or someone just "forgot" and the wrong lubricant was applied. But before the real cause is discovered—if it ever is—our lubricant is subjected to criticism and you waste time needlessly trying to find another.

Standard Coded Lubrication Service is our contribution towards solving your problem and ours.

The plan is briefly described at the right. Any plant is free to use this system or adapt it to its lubrication program. Plants in the Middle West, whether they use Standard Oil products exclusively or not, can get the materials needed, and the help of a Standard Lubrication Engineer in installing the service. Call the nearest Standard Oil Company (Indiana) office. Say you want to get more information about Standard Coded Lubrication Service. Or write 910 S. Michigan Ave., Chicago 80, Ill. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

How Standard Coded Lubrication Service works

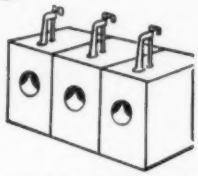
The first step in the plan is to assign code numbers to each lubricant used in the plant. Lubricants are simply numbered 1, 2, 3, etc. These numbers bear no significance as to type or grade of lubricant. Next, numbered decalcomanias (furnished by us) are applied to:

—every point of lubrication on every machine

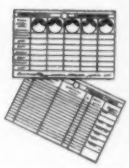
—every grease gun or oil can used in servicing equipment

—every container or drum on your lubrication carts where they are used

and every barrel, drum, or storage tank in your oil house.



You can see at a glance that oilers merely need to follow the code number when filling dispensing equipment from storage, and in applying the lubricant to the right place, which is clearly marked to show that lubrication is needed and what number to use.



Machine Record Cards: Where desired, a supply of machine record cards is provided. The card or a copy of it may be kept in office files. This card shows the number of points to be lubricated, lubricants to be used, and lubricating schedules.

Lubrication Chart: For control purposes, a card is provided to list, by brand name and code numbers, all lubricants used in the plant. This card is used by stock clerk or stockkeeper to enable him to requisition products by brand name, and to mark barrels with the correct code numbered decal.

This Booklet gives full details of how Standard Coded Lubrication Service can go to work in your plant. Ask your Standard Oil Man for a copy. Talk it over with him and the men in charge of your lubrication. See how this plan fills a gap in your lubrication program.

Oil is Ammunition . . . Use it Wisely

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

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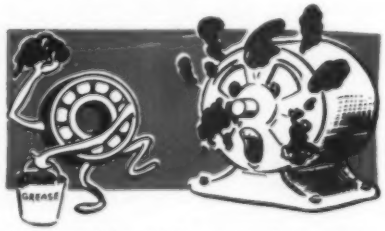
Lubrication *News* letter

Practical suggestions from the field on how Lubrication Engineering and lubricants are being used by midwest operators to lick tough wartime jobs

MAY, 1944

Replacing a hard-to-get lubricant leads to many savings. A special high-temperature lubricant was used on the spinner bearings of an evaporator dryer. Temperature in the dryer was 300° F. The high-speed spinner operated at 12,000 r.p.m. Under these conditions, a good lubricant was needed for the anti-friction bearings. The product in use was expensive and hard to get. This led to a test of a Standard lubricant. With it, bearings got adequate lubrication—with 15% less consumption—at 50% lower cost—and the Standard Oil product used was available at a moment's notice to this Minnesota plant from the near-at-hand Standard Oil bulk plant.



Three old problems and two solutions. Electric motors in an aviation engine plant were operated almost constantly. They were a heavy-duty type and carried heavy loads. All ran excessively hot—that was problem one. Grease leaked freely from the overheated bearings, and bearing life was short—problem two. Finally, grease that leaked out got into motor windings which required frequent cleaning—problem three.

A Standard Lubrication Engineer was given the job of trying to cure the ills. He noted that motor bearings were equipped with grease fittings for grease gun lubrication. This type of application is desirable and entirely satisfactory where accurate schedules are developed, or provision is made for indicating the amount of lubricant fed to the bearings. The Engineer's solution eliminated the need for both measures. First, he recommended fittings be removed. Second, he suggested hand-packing the bearings with a highly stable grease—Stanobar No. 2. One particularly troublesome motor was used to make the test. After six months it was established that three problems had been solved. Bearings ran cooler, leakage was eliminated, and there were no bearing failures. Now all motors get the same treatment and give the same results.

Beats wartime, three-shift operation to the draw. As a routine precaution, oil was changed once a year in the hydraulic system of an extrusion press at a Detroit plant. That was in peacetime when equipment was operating one eight-hour shift per day. Then Stanoil was installed to see if oil change periods could be lengthened. But soon afterward the shift to wartime tempo in production struck this plant—three shifts per day, seven days a week. Under these new conditions, hydraulic oils had to stand more than three times the punishment—continuous heat, agitation, contamination, etc. But operating conditions made it necessary to keep Stanoil on the job a year. Then a sample was tested in the Standard Oil laboratories. It was reported to be in excellent condition—low acidity, good color, etc. This report, however, did not surprise the plant superintendent. He had already had a sample tested by an independent laboratory. Its report was even more favorable. Stanoil was still fit after more than three times the service which formerly required changing oil.

For the want of a nail, the battle was lost. There's an old story of the battle that was lost for the lack of a nail from the shoe of the general's horse. Here's the counterpart of that story—in reverse. A contract deadline was made because the right lubricant was found.

The contract called for producing a certain number of very large, and unnameable, units in 105 days. A big horizontal milling machine was the bottleneck. It produced a comparatively small but important part of the unit. If the machine could be speeded up 10%, the part could be made, and the units completed within the time limit. But the manufacturer had had trouble with a worm gear on this machine. It usually had to be replaced after a 30-day run. He hesitated to increase the speed of this machine because of the excessive wear and frequent shutdowns that might be necessary.

When the problem was explained to a Standard Lubrication Engineer, he recommended Stanogear 6X. After a 30-day run, which was the average life of the worm gear, an inspection was made, and no appreciable wear was found. This saved a 24-hour shutdown for replacement. Production was resumed, and another run of 70 days was made without repairs. The contract was completed in 100 days.

See your Standard Oil Lubrication Engineer. One of these Engineers can help you find the answer to your difficult lubricating problems. Call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Ave., Chicago 80, Illinois, for his help. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

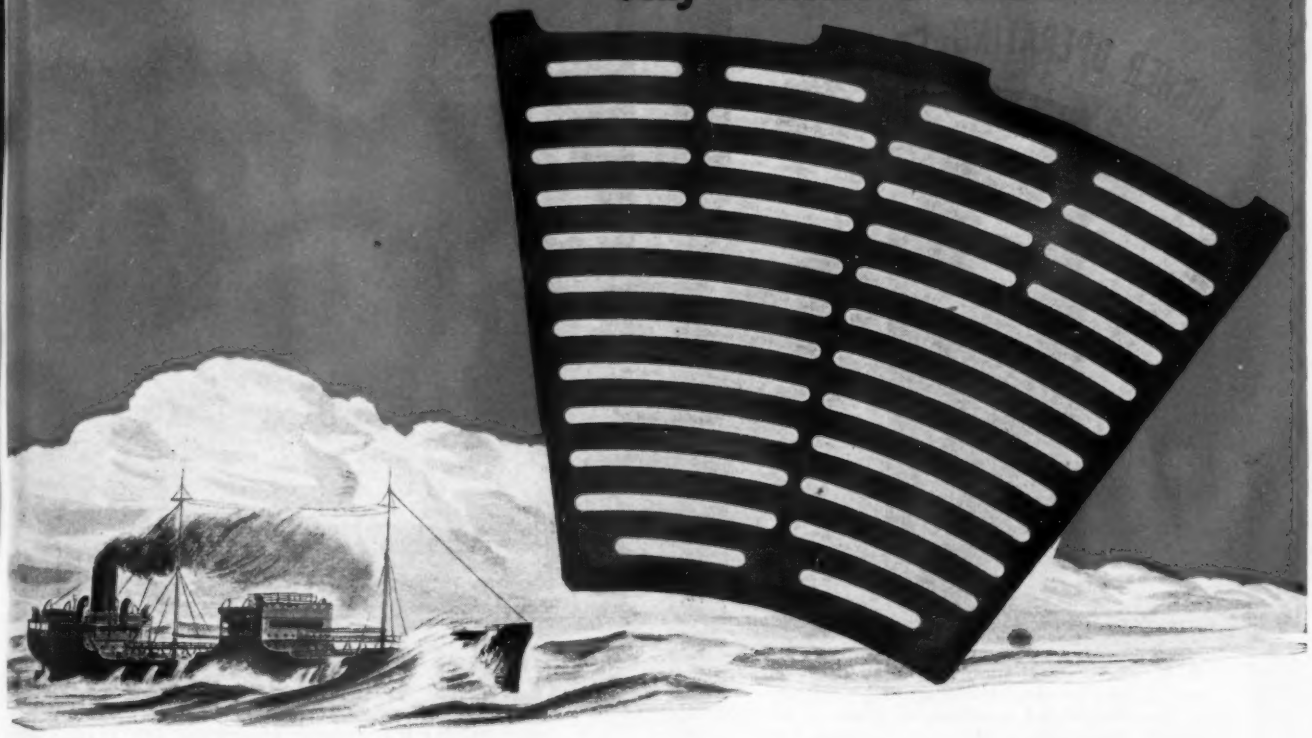
Oil is Ammunition . . . Use it Wisely

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

DISSTON made this valve plate full of slots

stay "flatter than a flounder!"



A great shipyard was having trouble making the valves for the scavenger pumps used to draw foul air and fumes from the holds of tankers. Several factors made this a tough job. The plate had to be made of stainless steel which would resist corrosive fumes. The overall area was large—460 square inches. But 130 square inches had to be cut out for slots, leaving 330 square inches—only 1/16 inch thick. Yet the plate *had to stay flat* to prevent leaks!

Here was another war job which needed care, craftsmanship and a supreme knowledge of steel. So naturally, it was put up to Disston . . . and Disston did it again!

DISSTON

Conserve Man-Minutes and help win the war

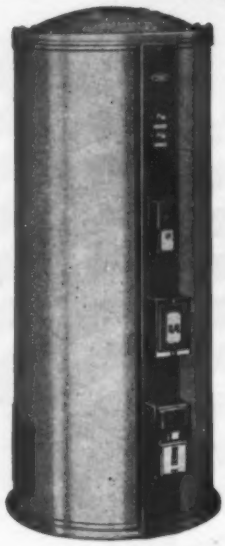
★ ★ ★

When you have pioneered in various kinds of standard tools for more than a century, as Disston has, you learn how to make steel *behave*. That's one reason why Disston products—steel, files, saws and many types of tools—perform so perfectly in war tasks or peace-time trades. For assistance on tool problems, write to Henry Disston & Sons, Inc., 520 Tacony, Philadelphia 35, Pa., U. S. A.

HONAN-CRANE "Continuous" Oil Purifiers

make possible

HIGHER OPERATING STANDARDS



● A "continuous" supply of clean fresh oil will greatly increase the operating efficiency of any lubricated equipment. Wear is reduced, down time is cut to a minimum and maintenance costs are decreased.

The Advanced Engineering and Design of Honan-Crane Oil Purification Equipment is the result of more than twenty years of experience in engineering and building oil purifying equipment. Proven and patented features produce outstanding results.

For a brief but comprehensive picture of modern oil purification write for the current issue of Honan-Crane publication — "On Land and On Sea." Topics cover: Current Oil Shortage, Safely Extending the Useful Life of Oil, Straining vs. Purification, Range of Application of Oil Purification Equipment. Engineering Features of Honan-Crane Equipment.

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HONAN-CRANE CORPORATION

205 WABASH AVE., LEBANON, INDIANA

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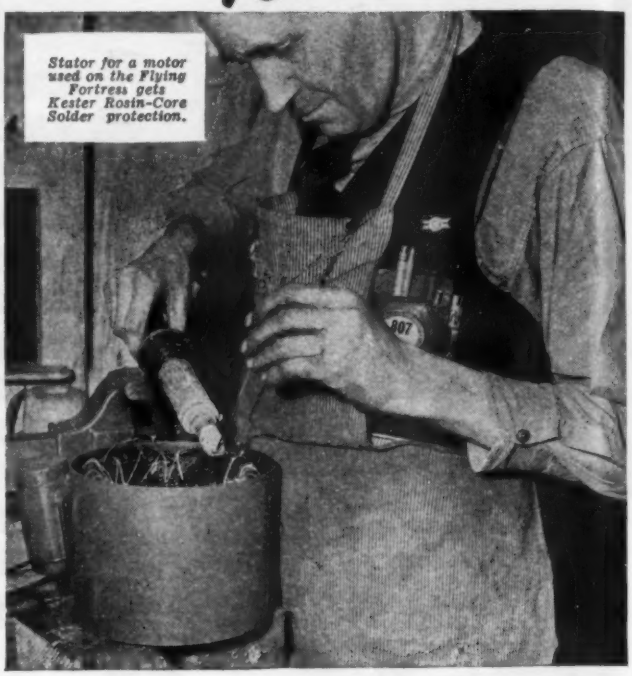

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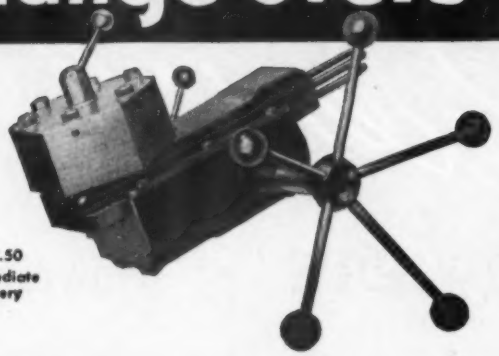

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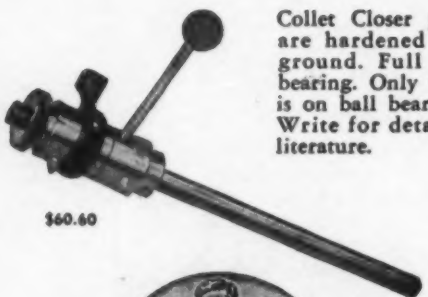

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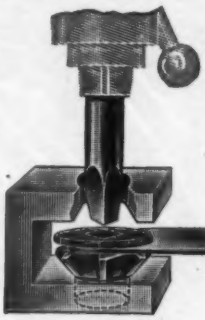

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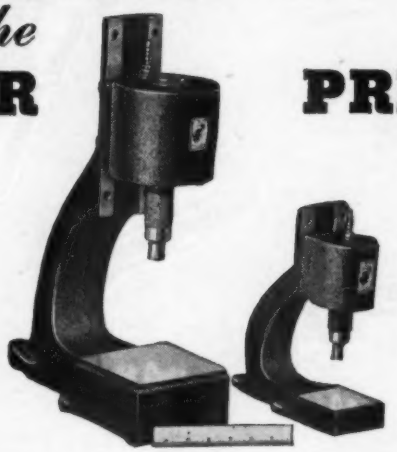

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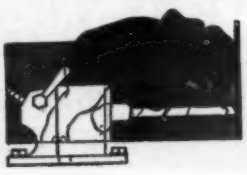

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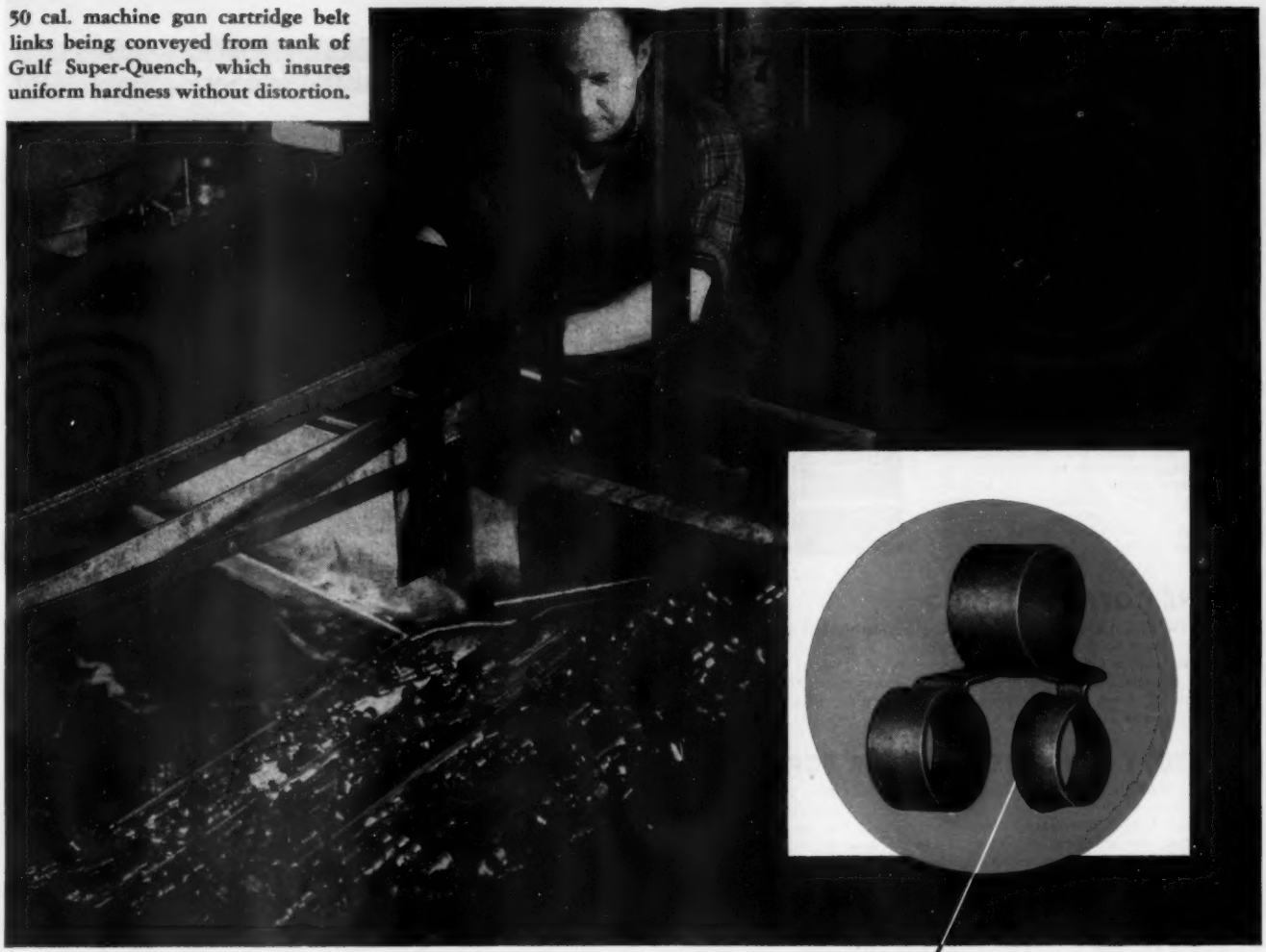

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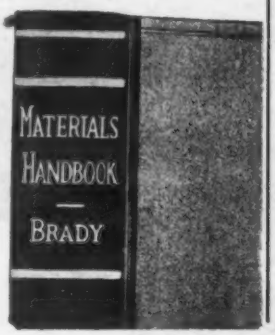

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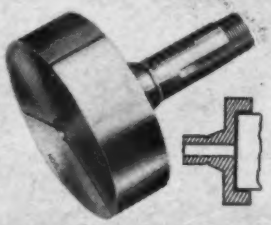

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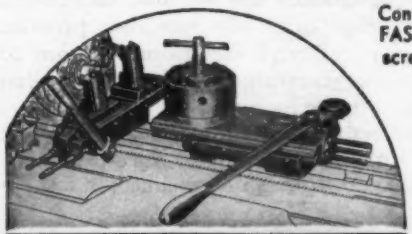

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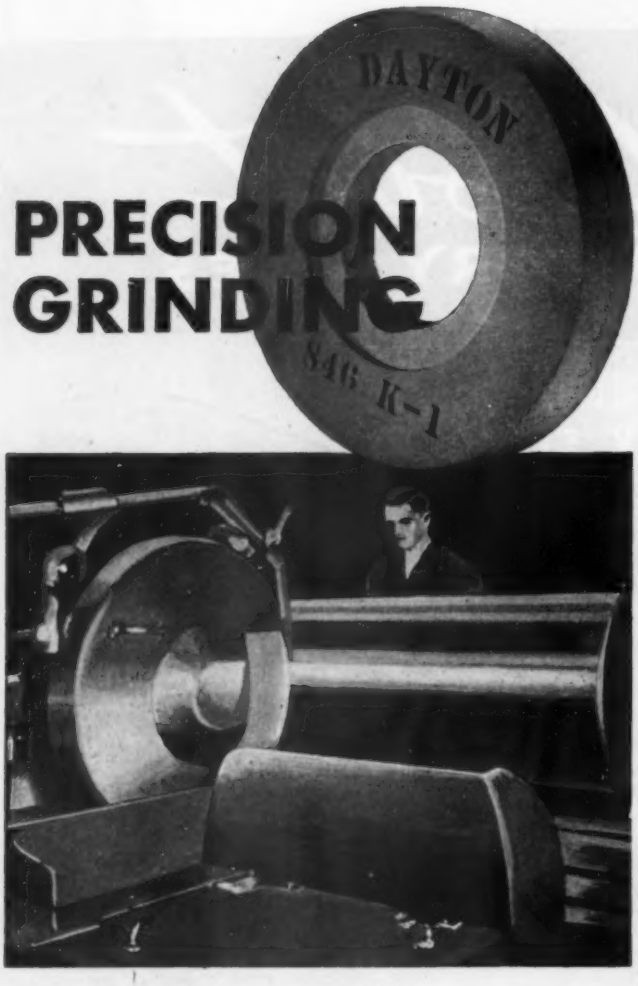

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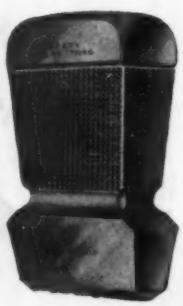

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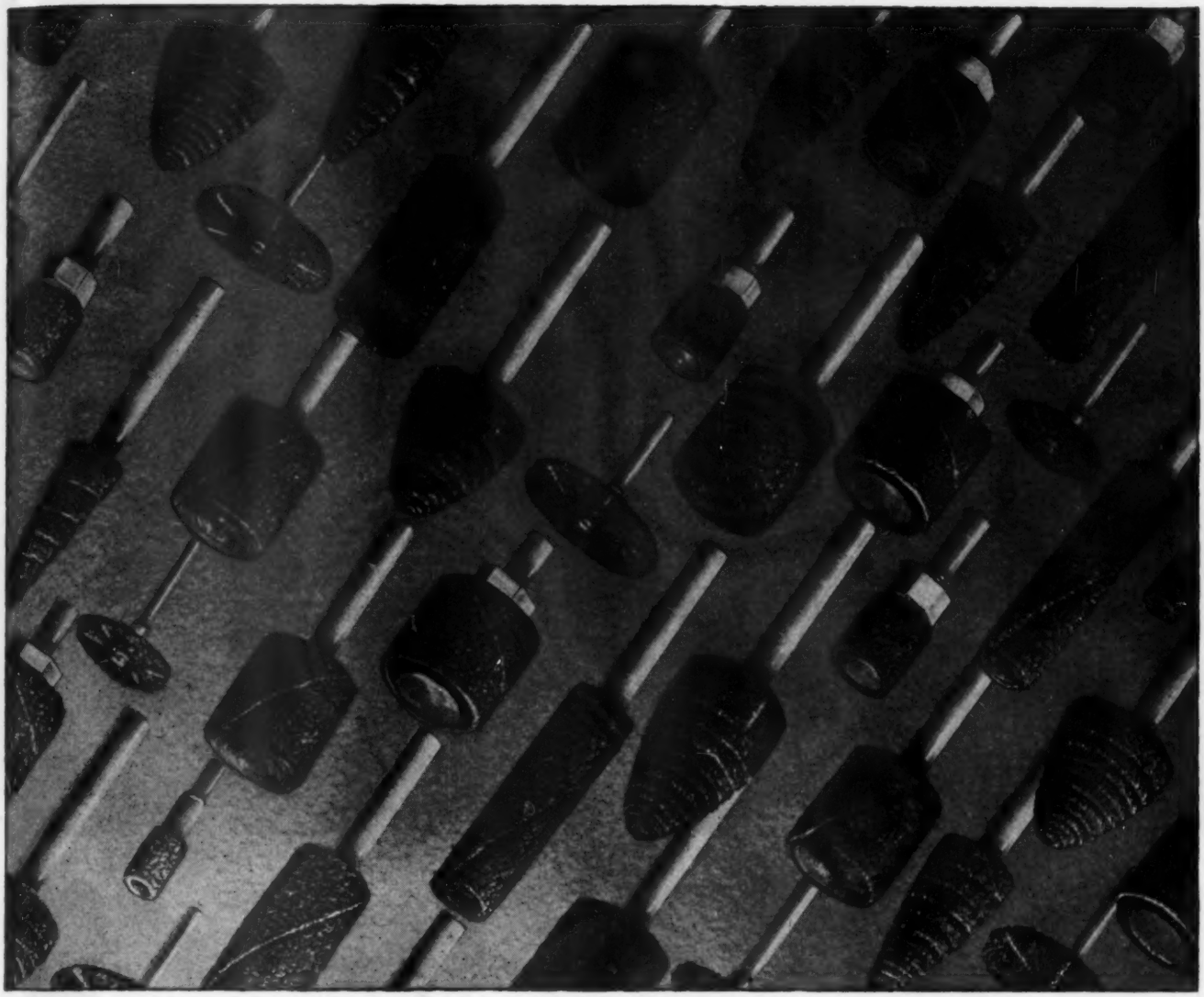

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The same unique design that characterizes this general boring tool (Style A) also distinguishes the two other types of Bokum Tools—Style B for facing and bottoming and Style C for internal threading.

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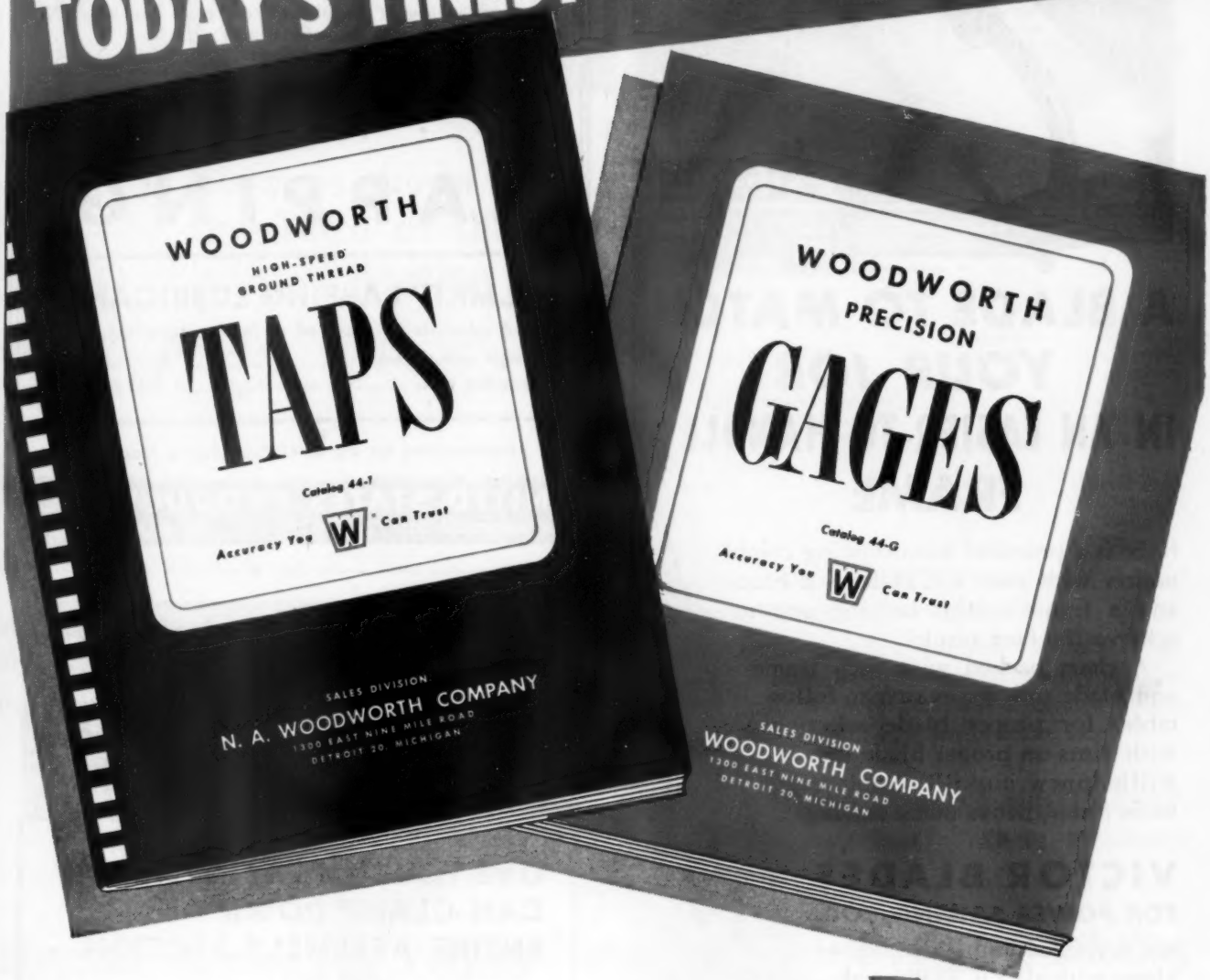

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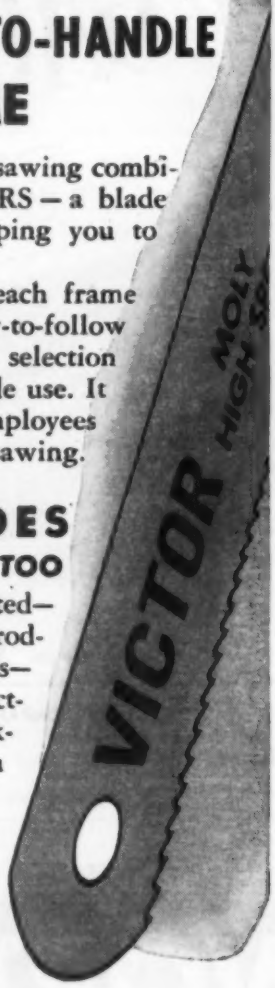
are described and illustrated—along with all VICTOR products including band saws—in "Metal Cutting", a fact-packed and helpful booklet which will be sent you on request.



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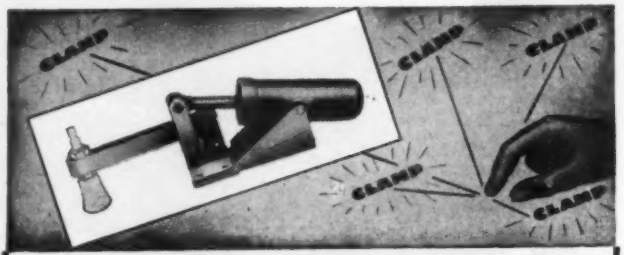

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From one control station a man can operate all the clamps around the extensive perimeter of an airplane section — or any other large assembly. He can make all the clamps come down simultaneously or at staggered intervals. He need not spend any time repeatedly walking around the work to operate each clamp individually.

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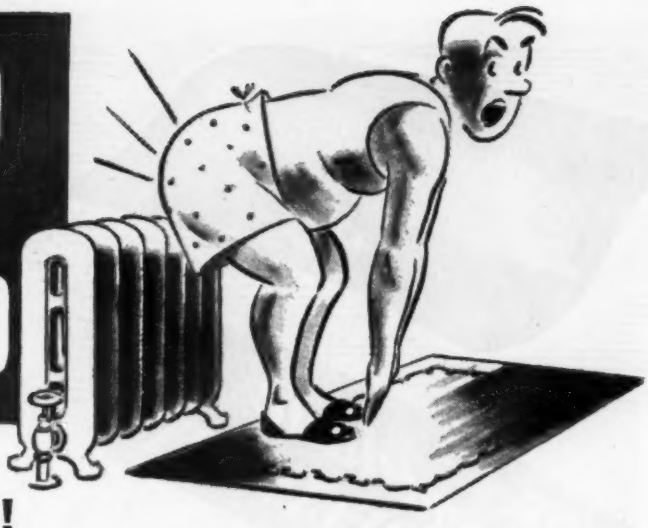

NOT in the case shown below! One-Third of the Grinding Time was Saved . . . without Heating

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WORK: Bearings—S.A.E. 52100 Steel hardened to 64 Rockwell C scale; 2.82 sq. in. surface ground per piece; 31 pieces per table load.

Detail	CORTLAND Chuck and Segments	*Competitive Brand Formerly Used*
Cubic inches of stock removed per inch in height of segments	350.0	87.5
Ampere readings	30	15
Dressings necessary	1	1
Work heat?	Cut cool with no noise	Heated work and squealed badly
Grinding time	112 sec.	180 sec.

Heavier feed could be used and better finish obtained with Cortland *Diagonal Shearing* Segments.

Why not find out just how Cortland Chucks and Segments can increase the quality and quantity of your grinding output? Write for our latest illustrated bulletin giving the complete Cortland performance story.

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A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

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NEW . . . FOR ALL HORIZONTAL BAND SAWS—Increase Production and Increase Blade Life—equip your saw for coolant cutting with a Gray-Mills Model S-30 system. You simply set the saw upon the coolant pan—hook up the feed tube—plug in the cord—and your saw is ready for wet cutting. Price $79.50

The New S-30 System is an improved design of the Gray-Mills S-20 System. It has an improved gear type pump with automatic pressure relief valve.

Gray-Mills' exclusive slotted feed tube for saw blade application; the flow control petcock above the feed; control switch in the cord; and special forced-settling baffles for separating chips from the coolant are other S-30 features.

It's easy and economical to equip any of your machine tools with a Gray-Mills Portable Coolant System—to give them the tool-saving and production-increasing advantages of using coolants. Gray-Mills Systems include a complete range of pumps, coolant return pans and fittings for quick and simple application to most any machine tool. Varied pump capacities, both gear and centrifugal, are available to provide proper pressure and volume for the job.

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FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS

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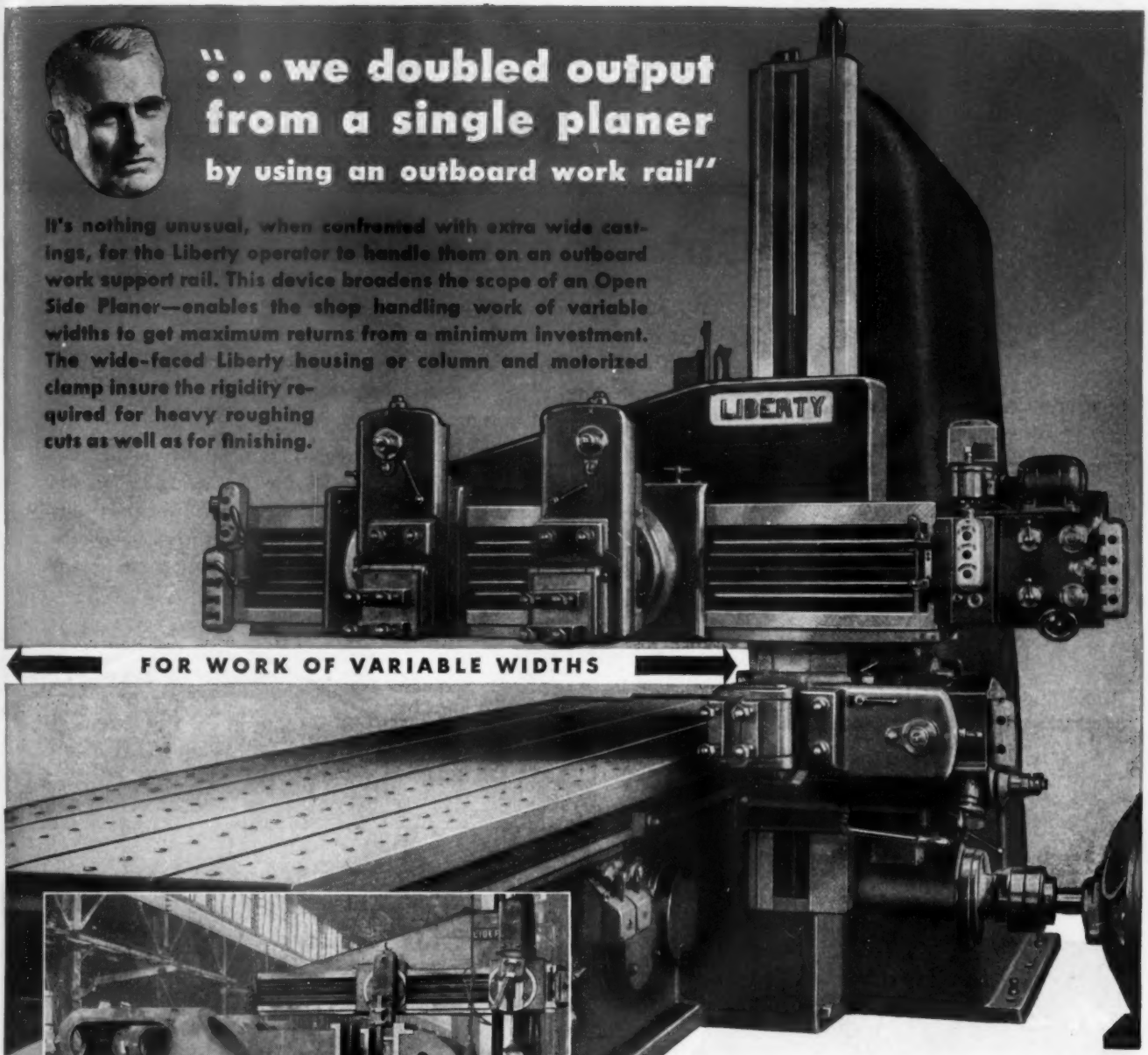
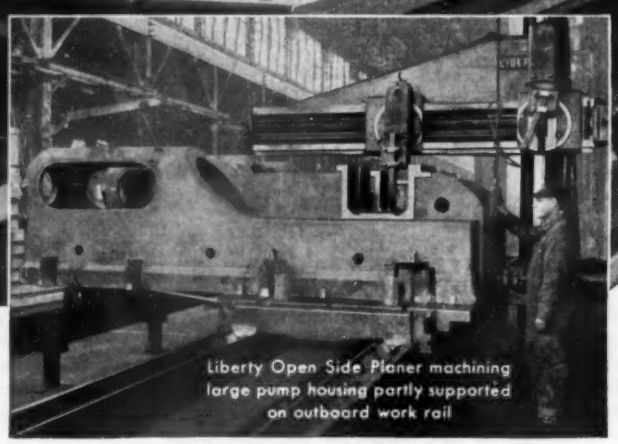


FOR WORK OF VARIABLE WIDTHS



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Now Even the Operator of Limited Experience Can Dress and Re-dress

ABRASIVE WHEELS

Accurately and Quickly to

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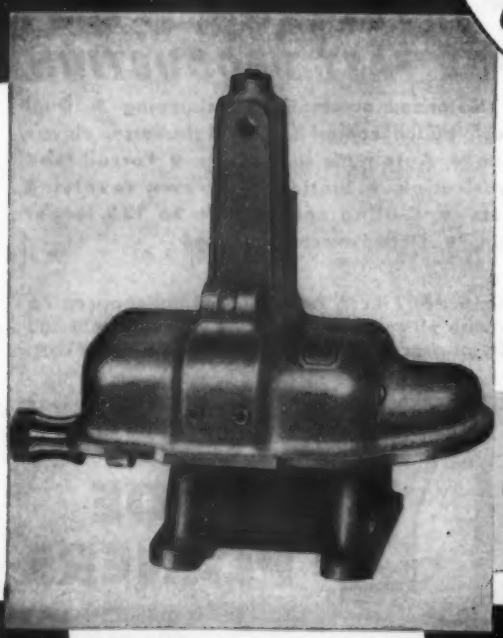

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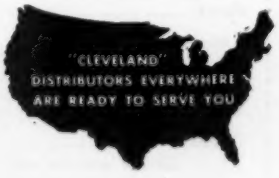

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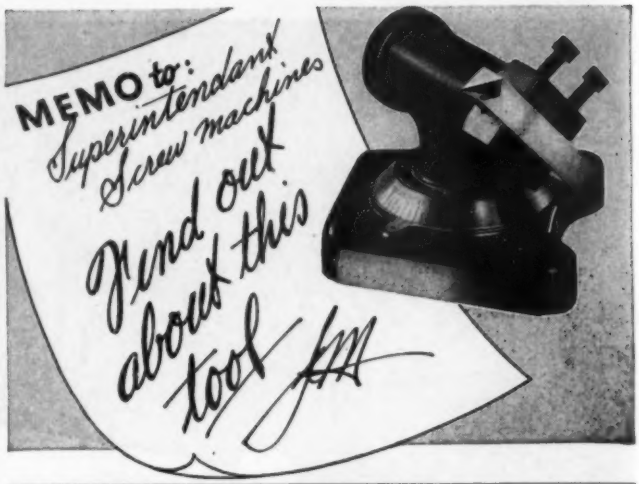

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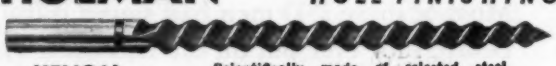

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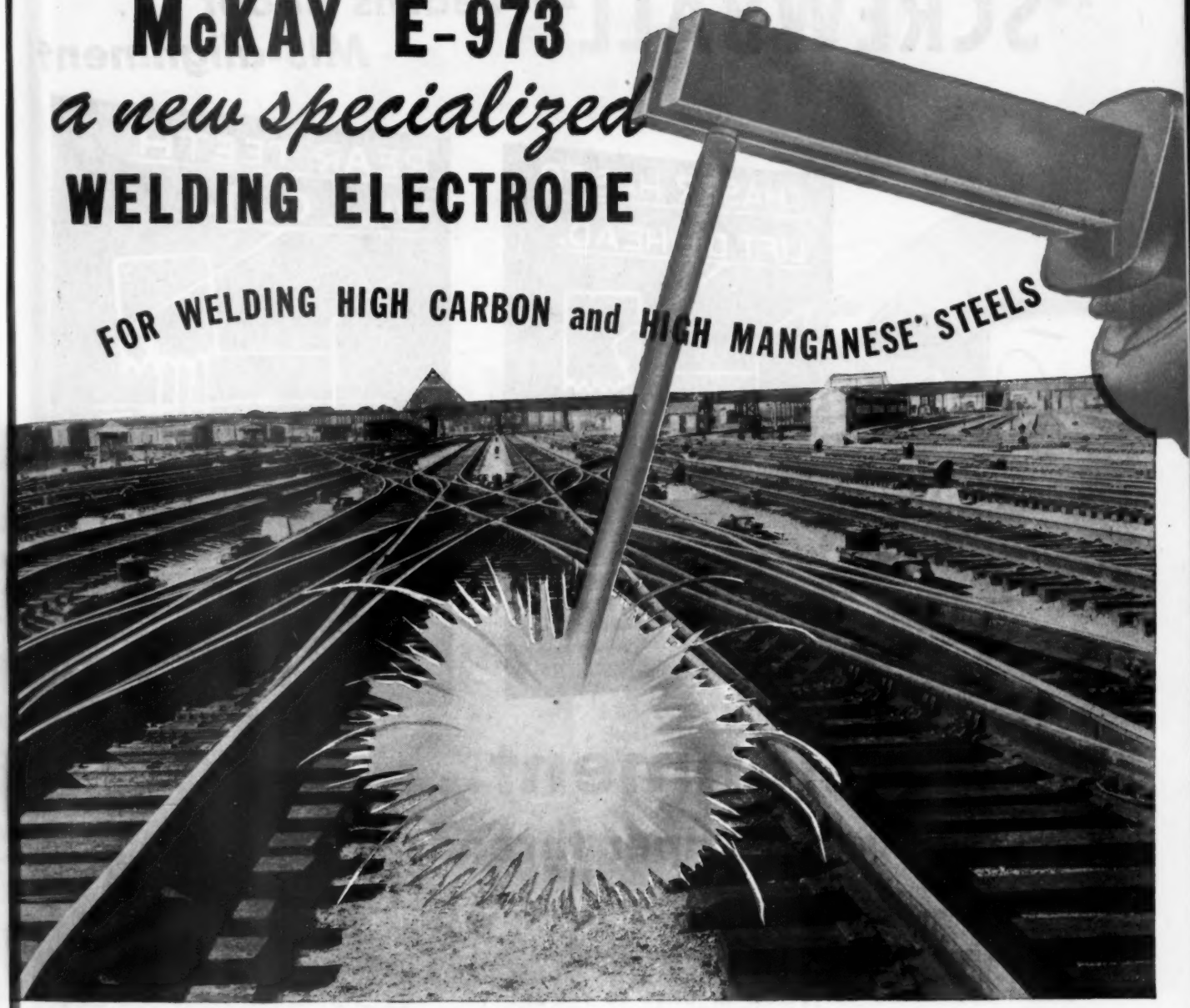
FOR WELDING HIGH CARBON and HIGH MANGANESE STEELS



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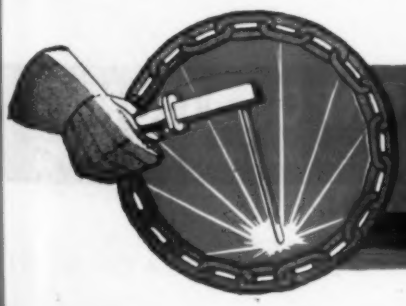

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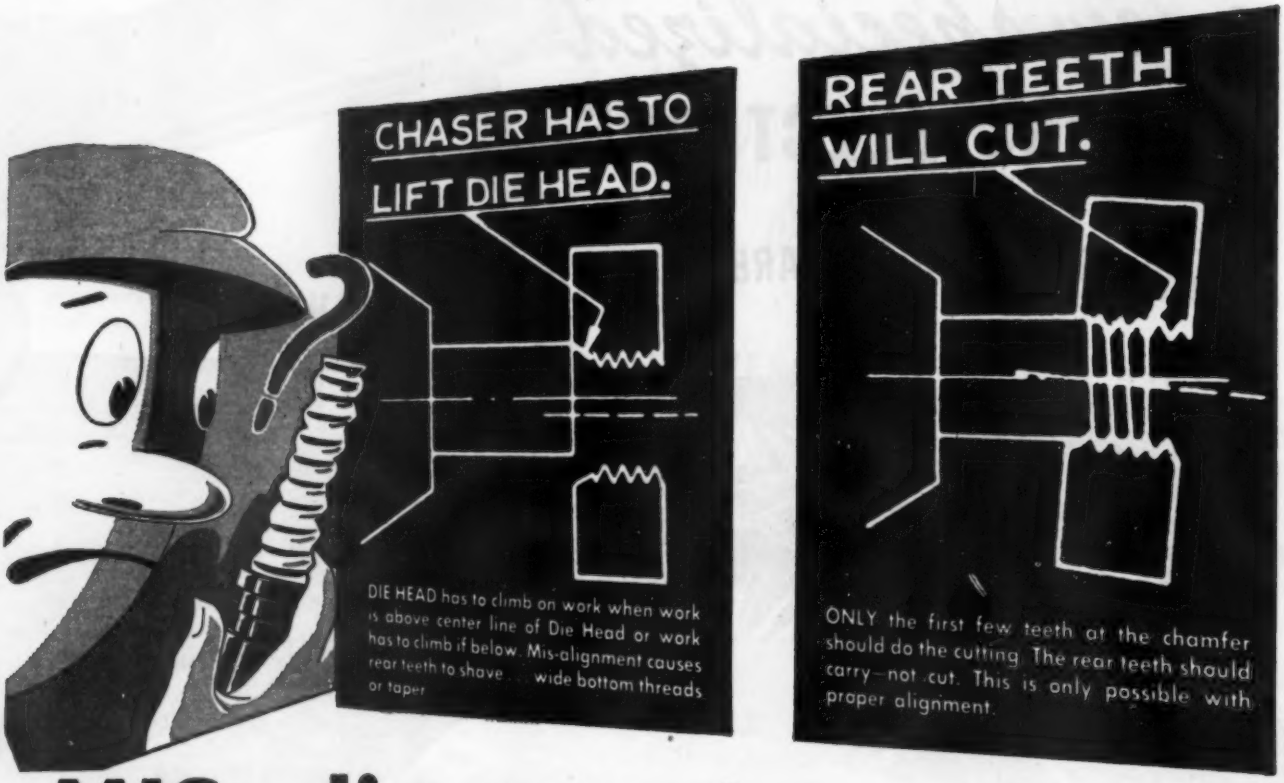
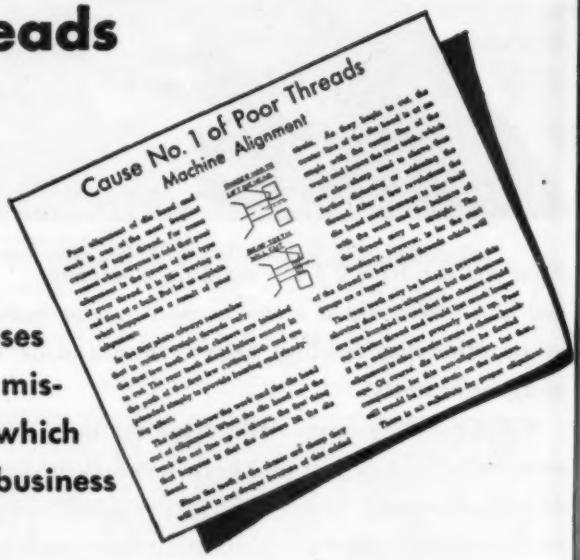

CHASER HAS TO LIFT DIE HEAD.
DIE HEAD has to climb on work when work is above center line of Die Head or work has to climb if below. Mis-alignment causes rear teeth to shave ... wide bottom threads or taper
REAR TEETH WILL CUT.
ONLY the first few teeth at the chamfer should do the cutting. The rear teeth should carry—not cut. This is only possible with proper alignment.

MIS-alignment...
chief cause of taper threads

Seven times out of ten the cause of taper threads is machine out of alignment. This condition should be corrected at once to reduce rejections and give longer life to chasers.



FREE—Die Headlines Numbers 1 and 2—The causes of taper thread and correction of machine mis-alignment are discussed in detail in these issues which will be gladly sent upon request. Please use business letterhead.

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MO-MAX High Speed Steel is backed by ten years of successful use, and is established as a standard for quality and quantity production. If your regular steel supplier doesn't have MO-MAX High Speed Steel contact any one of the fourteen leading tool steel producers listed below.

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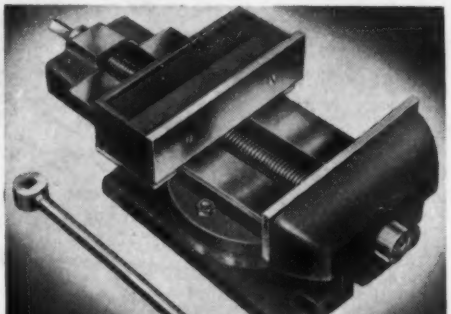
SPECIFICATIONS: Jaw opens 13"; jaw width 12⅝"—depth 3¼"; overall length 24¼"; weight 260 lbs.



ALLIED MACHINERY & SUPPLY COMPANY

548-550 W. MONROE STREET CHICAGO 6, ILL.

The ALLIED Heavy Duty Vise is designed and constructed for handling the "tough" production jobs that require a rigid, dependable vise. $150.00

DoALL INDUSTRY'S NEW SET OF TOOLS

Write for Literature, mentioning products in which you are interested.

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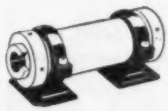
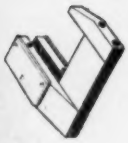
Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Portland, Rochester, Rockford, St. Louis, Salt Lake City, San Francisco, Seattle, Spokane, Toledo, Tulsa, West Hartford.

"GO!"





Component Part of Victory

Behind the performance of American bombers are the countless precision-built parts that comprise them. *These* are the component parts of Victory—these are the parts that make our planes—and our machines—worthy members of our fighting team. And determining the "GO" or "NOT GO" of these vital parts—insuring the precision standards of manufacture on which their reliability and the lives of our men depend—that's the role being played on all the world's battle fronts today by Kobe's fine gages.

Bred in peace time . . . perfected by research and experience . . . and produced at an ever accelerating pace to meet wartime needs, Kobe's gages are today the very symbol of fine workmanship. Totally mobilized for war at present, they are serving America's industry and armed forces on hundreds of critical manufacturing jobs. Their never-failing quality . . . their hair-line exactness . . . their utter dependability to do the job and do it *right* . . . THESE are the features of Kobe's fine gages that make possible the accurately precisioned parts that go into our weapons of Victory. Kobe is justly proud of its progress. It is justly proud of its role in helping to win the war. While today its gage division is totally mobilized for this purpose, it has not lost sight of its peace time responsibilities. Kobe gages are being constantly tested, re-tested and improved in the crucible of war. Out of this experience will come obvious benefits which will be passed on to peace time industry. So whether it's today—during wartime, or tomorrow—during peace time, when you think of truly fine gages, think of Kobe!

KOBE

Master and Reference GAGES

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3040 East Slauson Avenue • Huntington Park, California

DUMB DORA'S GETTING SMARTER AND SMARTER

She's Found 101 New Uses For *SPEEDI-DRI*

SPEEDI-DRI is the finest product of its kind for removing oil and grease from floors; setting up a non-skid surface, and retarding fire. But 101 new uses for SPEEDI-DRI have been discovered! SPEEDI-DRI reclaims oil-soaked rope and power belts; reconditions oil-soaked shoes and clothing; deodorizes the plant; removes oil film from tools; is used during tumbling and after heat-treating processed parts to remove oil-film; increases light reflection in dark plants; helps prevent dermatitis caused by oil-soaked shoes; dries up floors that "bleed" in hot weather; better than sand in fire buckets. You'll discover many other uses for it, too. It's indispensable! Write at once for literature and FREE SAMPLE.

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SPEEDI-DRI
OIL AND GREASE ABSORBENT

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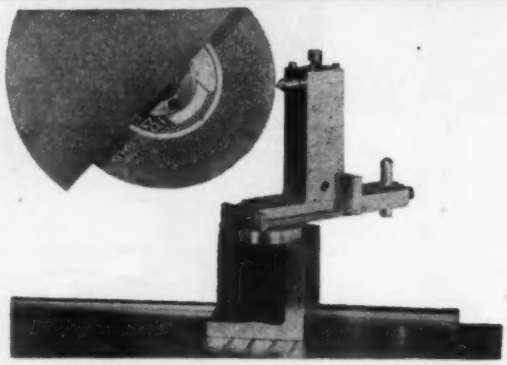
The "FORM-MASTER"
ANGLE & RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00.

It readily produces: Any desired angle
Convex radii to 4" on 7" wheel
Concave radii to 7" on 7" wheel

Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by
J. & S. TOOL CO.
477 Main Street East Orange 1, N. J.
"PRECISION DRESSING TOOLS"

Investigate
THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

You'll find the *Why, What, Where* and *When* of POPE Spindles clearly covered in this boiled-down Bulletin that you can read in two minutes flat.

You'll agree when you've read it that the story of POPE Precision Sealed Lubrication Spindles is worth *that* much of your time and maybe a whole lot more.

It's yours for a penny postcard. Just jot down your name, position and company address and say, "Send me Bulletin A."

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POPE MACHINERY CORPORATION

ESTABLISHED 1920

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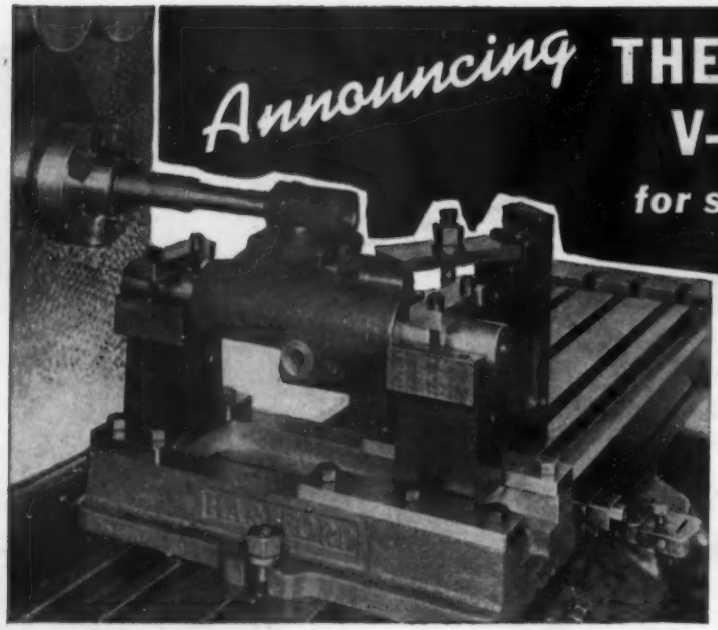
BUILDERS OF PRECISION SPINDLES



Announcing **THE NEW 'HARTFORD' V-BLOCK FIXTURE**

for speeding and simplifying Boring Operations

The "Hartford V-Block Fixture" is simple in design and rugged in construction. It has a semi-steel base, accurately machined and scraped. Cross Keyways provide ample clamping facilities for attaching to machine table. Adjustment of V-blocks is facilitated by positioning clamps. Accurately hardened and ground V-block and clamps for holding test bars or arbors in place are included in the equipment furnished.

This new "HARTFORD" development—applicable to milling, boring, drilling, and inspection operations—provides a practical, convenient method for locating and holding a wide variety of work.

When used (as shown here) for setting up an irregular casting for boring on a milling machine, this new device greatly facilitates machining. The first hole is bored in the casting and the other holes thereafter are bored parallel to and in accurate relation to the arbor.

Full details are available on this new "HARTFORD" fixture which is a "New Adaptation of an Old Principle".

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT

Your Copy FREE on Request

DRILL JIG **BUSHINGS**

ABC TRADE MARK

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ACCURATE BUSHING CO., 440 North Ave., Garwood, New Jersey.
Gentlemen: Kindly send me your new FREE Catalog covering A.B.C. Drill Jig Bushings

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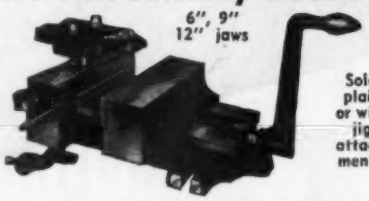
For Many Operations on Many Machines

In its three sizes, and with numerous Attachments converting it into a variety of jigs and fixtures, this Vise is a regular jack-of-all-trades on miller, drill press, shaper, radial, planer, grinder, etc.



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GRAHAM MULTI-PURPOSE VISE

KNURL HOLDER FITTING LATHE TURRET

Made to fit your turret, this "adjustangle" Holder cuts many patterns of knurling with only straight knurls. Sizes up to 1½" work dia.

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EDDY SERVICE GAGES

Pay for Themselves on Their First Job

Style No. 22, 2 spindle gage. To gage all sizes from 0" to ¾". Price $10.00 each net.

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We make 20 other styles of gages in all sizes up to 12". Send for folder.

Eddy Manufacturing Co.

321 Pine Street Pawtucket, R. I.

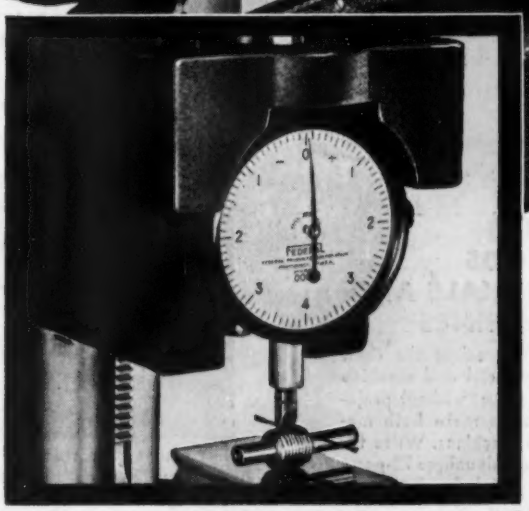
It's New - a COMPARATOR with MICROMETER HEAD and DIAL INDICATOR

YOU SET IT DIRECTLY WITHOUT MASTERS

The combination Micrometer and Dial Indicator Head incorporates its own Master. A complete set of Gage blocks, or masters, are not necessary. You simply set the micrometer to the required dimension, lock it, and then compare workpieces, etc.

MODEL 120 B-1

This comparator is very convenient for tool rooms and shops having miscellaneous job lots of duplicate workpieces. Anvil has both smooth and serrated surface.



THREE-WIRE THREAD MEASURING

is easy on this new comparator because the Micrometer Head enables you to read the actual dimension of the Pitch Diameter. The Dial Indicator then compares the diameters of other similar screw threads. The weight over the Indicator is for coarse threads.

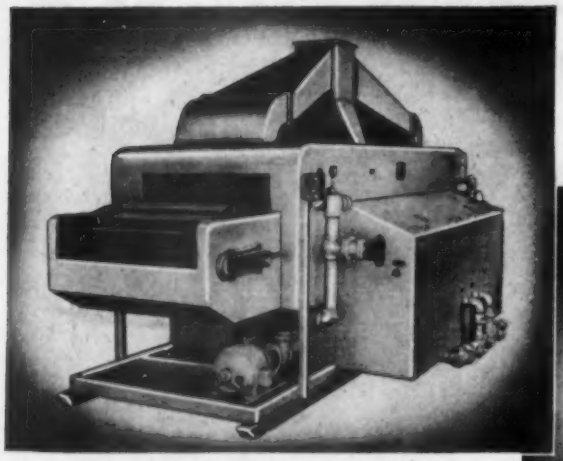
FEDERAL PRODUCTS CORPORATION · 1144 Eddy St., Providence, R. I.

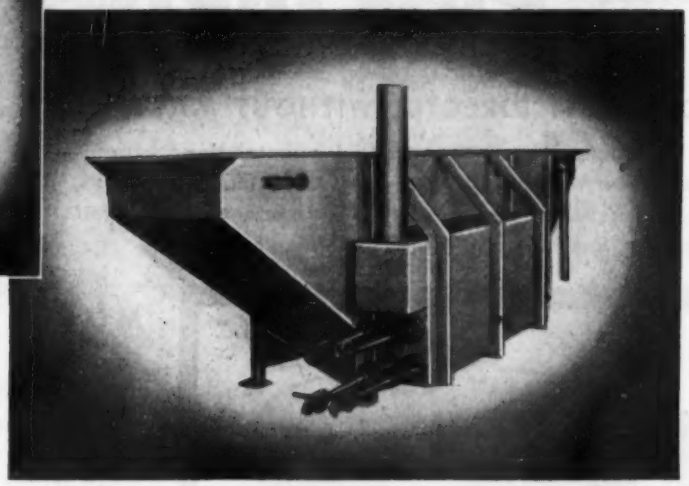
★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

Quicker . . . Better . . . Cheaper . . . for Most Metal Cleaning Jobs!

MAGNUS Emulso-Clean





DIP OR SPRAY IT ON!

The solution is dipped or sprayed on the work, in a tank, a portable cleaning machine, or an automatic washing machine, depending on the nature of the work and the volume handled.

RINSE IT OFF!

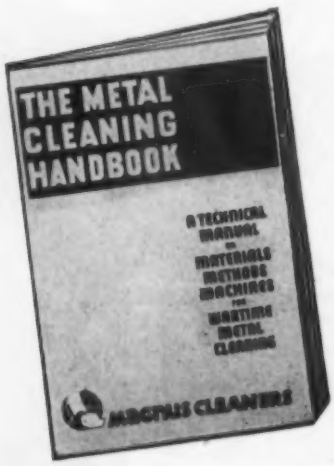
After a brief soaking period, the work is flushed off with pressure water or with safety solvent. Completely clean surfaces for every purpose except plating, without the use of heat!

The Magnus Emulso-Clean method of cleaning all metals can be carried out in dip tanks as shown in the photo at the right above, or in completely automatic spray machines typified by the left hand photo. Magnus makes not only the cleaning materials, but designs and builds any type of tank or machine your particular process requires.

The Emulso-Clean method applies to practically all metal cleaning operations, since it speedily removes not only grease and ordinary dirt, but does a thorough cleaning job on many dirts untouched by other methods, such as "smut" on steel, some buffing compounds and other process dirts.

Emulso-Clean uses Magnusol, a concentrated emulsifiable solvent, which is mixed one part to eight parts of kerosene or safety solvent to make the cleaning solution.

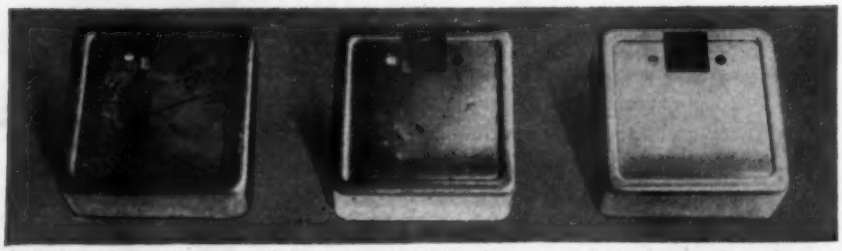
Used at room temperature and pressure rinsed with cold water, the Emulso-Clean solution is harmless to all metals, non-toxic, non-inflammable and easy on hands and skin.


THE METAL CLEANING HANDBOOK
A TECHNICAL MANUAL ON MATERIALS METHODS MACHINES FOR MODERN METAL CLEANING
MAGNUS CLEANERS

MAGNUS CHEMICAL COMPANY
60 SOUTH AVENUE **GARWOOD, N. J.**
Representatives in Principal Cities

MAGNUS METHODS MATERIALS AND MACHINES

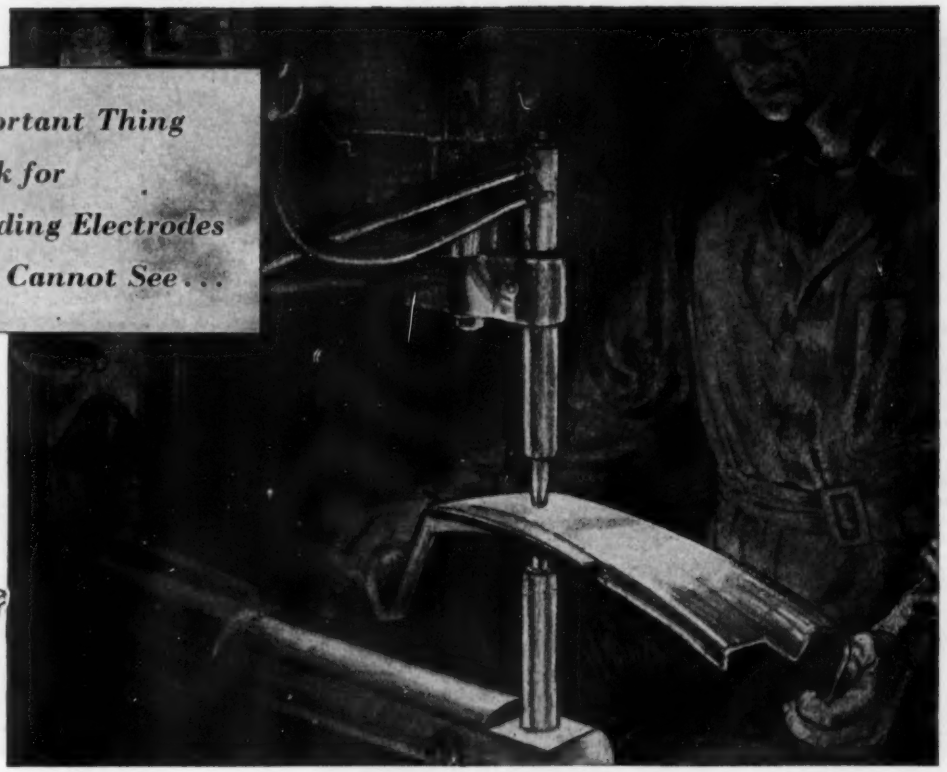
We help you select the right method, material and machine for your product without prejudice, since we make both materials and machines. Write for your copy of this unique 72-page manual on metal cleaning methods, materials and machines.



Instrument case stamped with lubricant containing lithopone. Left: Case before cleaning. Center: Case after Emulso-Clean dip and rinse. Ready for any finishing operation except plating. (Note water break which indicates need for chemically clean surface if plating is to follow.) Right: Case electro-cleaned with Magnus 94XX for plating.

Magnus CLEANERS-METHODS-MACHINES

The Most Important Thing
To Look for
in Resistance Welding Electrodes
is Something You Cannot See . . .



MALLORY Engineering Skill . . . For Better Alloys and Sturdier Electrodes

Back of every Mallory resistance welding product is a mass of engineering information, invisible to the customer, but of the utmost importance to him. From this accumulated knowledge have come many important advancements in the field.

In the design of resistance welding electrodes and holders, Mallory engineers anticipate trends in the industry with products that do the job better at less cost. While the products are being built, they constantly test their quality and fitness. And after they are placed in service, they check their performance for possible improvements.

As a result, Mallory today gives you alloys—Elkaloy*A, Mallory 3 Metal, Elkonite* and many others—of higher electrical conductivity and wear resistance. It offers as items of *standard equipment* electrode sizes and shapes which formerly had to be made to order. In the even better products of tomorrow, Mallory customers will find the results of today's research.

This invisible factor—Mallory engineering—is at your disposal whenever you have a problem regarding resistance welding electrodes or their use. Let us demonstrate how it can help you.

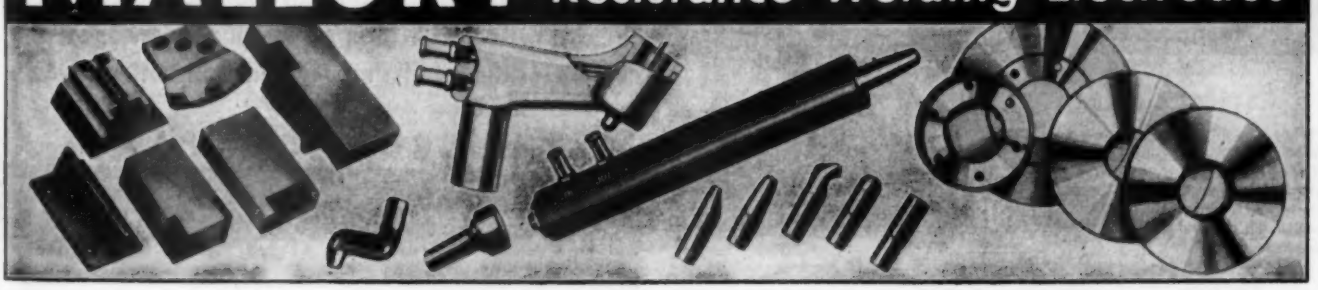
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

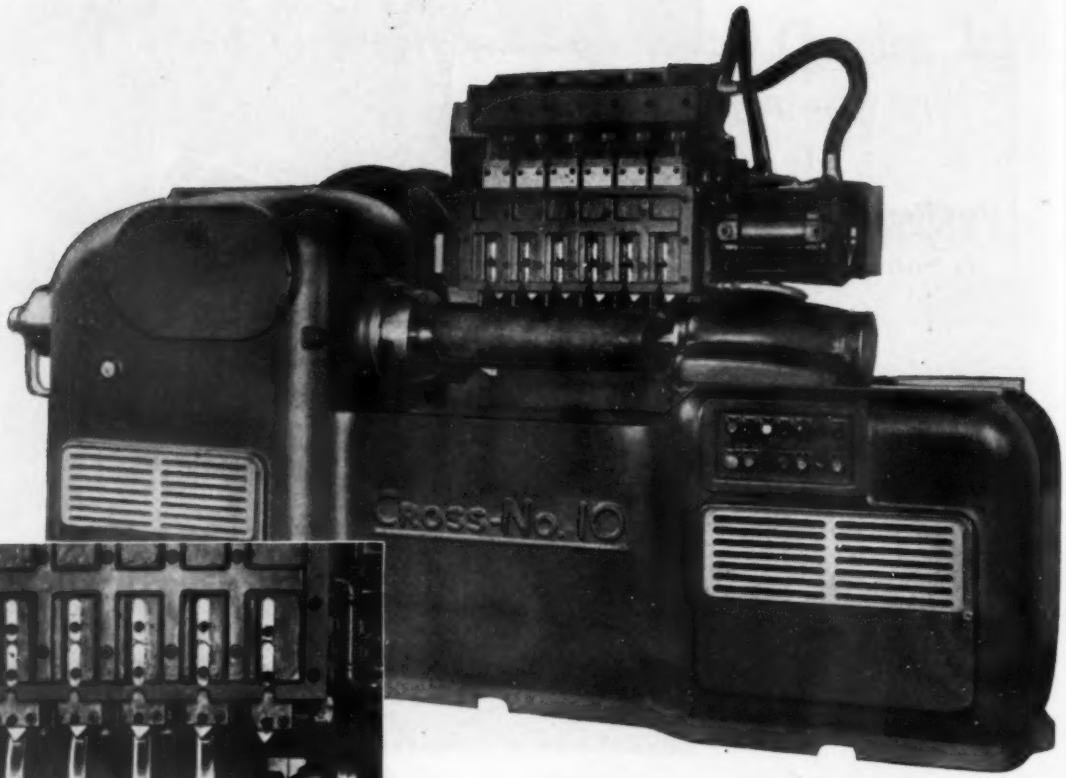
Before Anything Else, Buy War Bonds

**Reg. U. S. Pat. Off. for refractory metal compositions*

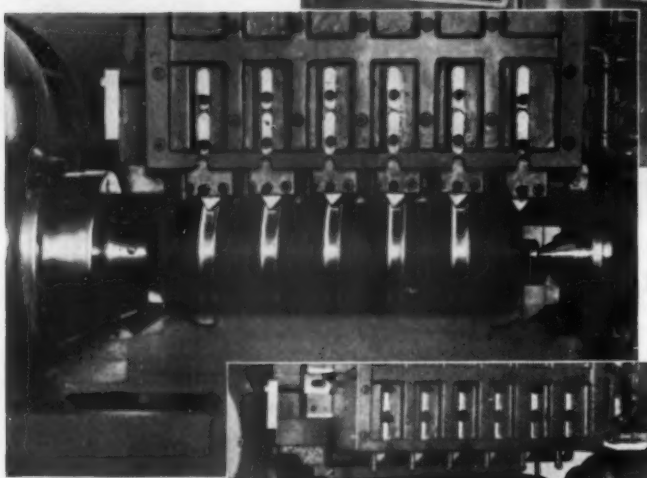
P. R. MALLORY & CO. Inc

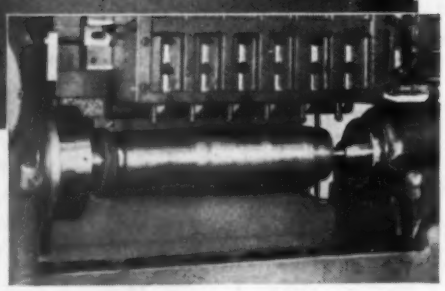
MALLORY *Standardized Resistance Welding Electrodes*





The overhead tool carriage is constructed to provide the tools with rigid support close to the cutting edge. Uniform cutting pressure is maintained with a smooth, powerful hydraulic feed. Chips fall clear of the work and allow a free cutting action.

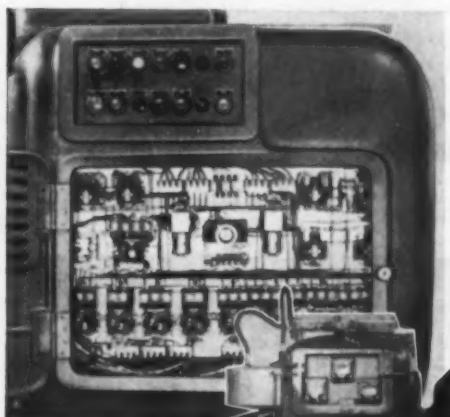




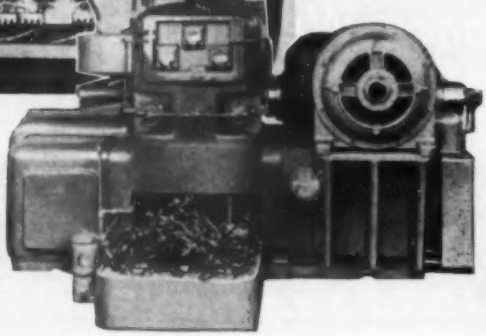
Six turning tools, a cut-off tool and a base facing tool all cut at the same time, and without vibration, while finishing large caliber rough forgings to accurate bottle form in one operation.

CROSS *Shell* LATHE

Cross Shell Lathes are noted for their productive capacity, durability and ease of operation. They are built to take the fullest advantage of multiple carbide tooling with an automatic operating cycle and ample capacity for handling up to 100 horsepower. The merit of their original design and the quality of their construction are reflected in the performance records of the leading shell shops at home and abroad.



Handles and levers have been eliminated. Everything is controlled by push button — clamping, the tailstock, the spindle clutch, the automatic operating cycle — and all are interlocked for safety

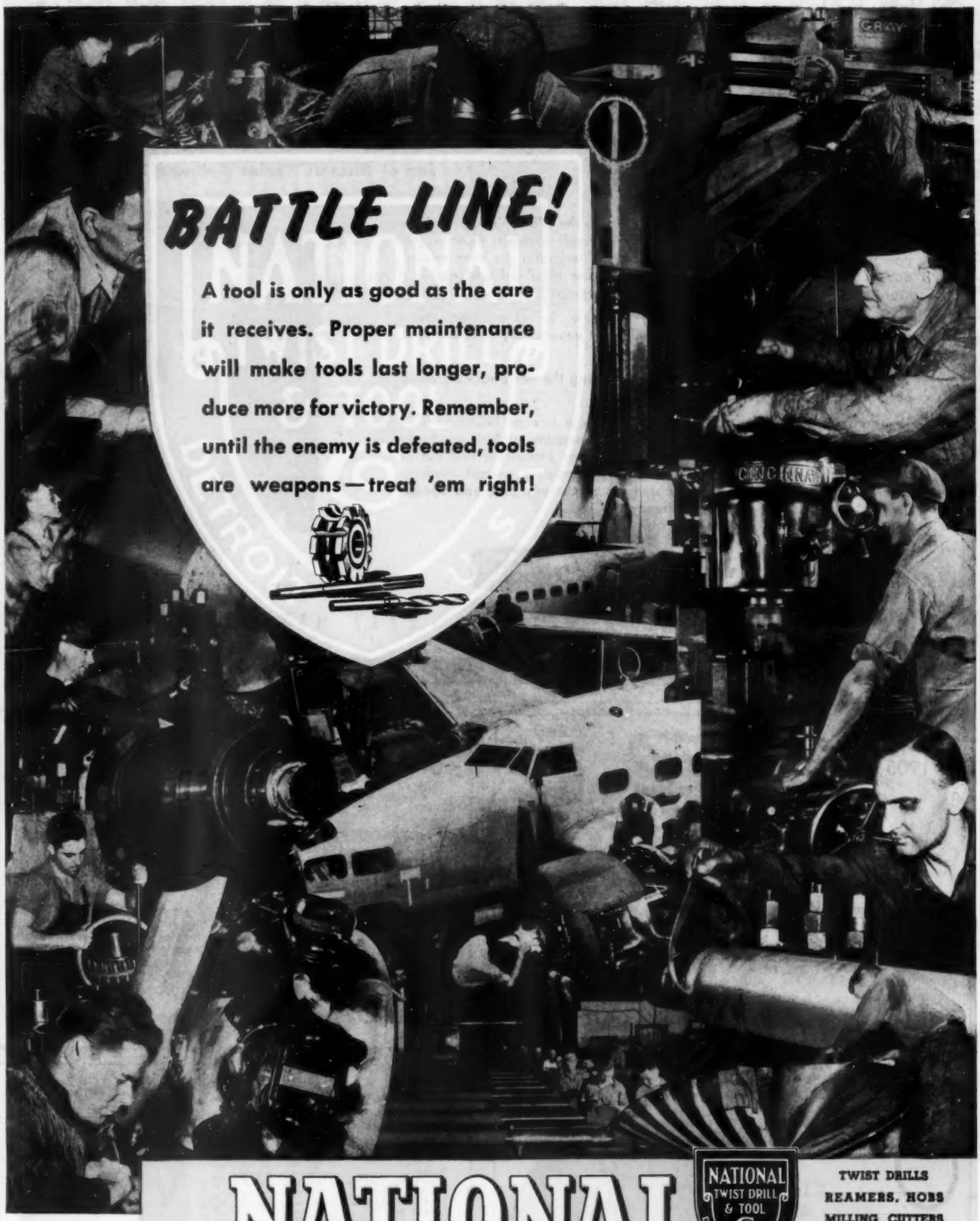


The motor is off the floor and coupled directly with the clutch shaft to eliminate belts. Automatic chip disposal is provided.

THE CROSS COMPANY

Established in 1898

DETROIT, MICHIGAN U·S·A


BATTLE LINE!
A tool is only as good as the care it receives. Proper maintenance will make tools last longer, produce more for victory. Remember, until the enemy is defeated, tools are weapons—treat 'em right!
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National cutting tools, sold by leading Mill Supply Distributors, are tools of character.

WE CAN IMPROVE YOUR MARKING, TOO!

This NOBLEWEST Rapid, Precision Marking Machine speeds up the marking of Aircraft Engine Cylinder Barrels.

★ "One of the best machines that's come into the plant," exclaimed an official in one of the country's leading aircraft factories — does the stamping of identification numbers formerly requiring six men — and does it better. Inscriptions of uniform depth are obtained and marking tools last longer under controlled pneumatic pressure

This efficient NOBLEWEST Marking Machine, being equipped with casters, is wheeled to the work, thus making it unnecessary to route parts to a central marking machine.

Worth several times its cost alone by eliminating the nerve racking noise of hand stamping.

The model illustrated is but one of a complete line of NOBLEWEST marking equipment. We gladly design special purpose marking machines and our engineers will cooperate with you in the placement and use of NOBLEWEST marking equipment to obtain greatest overall marking efficiency and speed. Write us about your marking problems today. Your inquiry will receive prompt attention.

MARK IT BEST WITH NOBLEWEST® NOBLEWEST IMPROVED MARKING DEVICES

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1905 **Strand** 1944

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3 Speed Vertical

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Capacities 1/8 to 3 H.P.
Rotary Files.

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TORNADO Electric Writing Tool. Writes fast as fingers can move.

—as easy to use as a pencil—

TORNADO WRITING and ETCHING TOOLS

TORNADO Electric Writing Tool is used for marking everything—brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

TORNADO Electric Etchers are used for marking valuable dies, tools and other portable equipment. Contact point of Etcher, when applied to product, burns permanent identification. *WRITE FOR COMPLETE DETAILS*

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RANDALL & STICKNEY

New 1/10,000" Indicator
Model C-10

Range	.2"
Diameter of case	1 15/16"
Diameter over all	2 1/4"
Depth of case	3/4"
Length over all	3 1/2"
Lug or Bracket—Offset, on center if desired	Hole 3/16"
Back held in position by	4 large screws
Center of spindle to center of hole in lug	15/16"
Weight	5 ounces
Stem	.9/32 diam.
Dial	0-5-0 or 0-10
Graduated	.0001"
Crystal	Non-breakable

Model C-10

RANDALL & STICKNEY
Waltham 54, Mass., U.S.A.

Makers of Gauges Since 1885

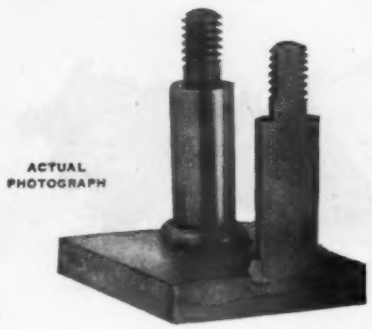
How to save up to 75% of your stud welding time and material cost

Five years experience and over 200 industrial plant users have proven the Nelson Electric Arc Stud Welder to be the simplest, most-flexible means of automatically end-welding studs to metal surfaces. *With it an operator can make from 500 to 1000 welds per shift.* Here's what it is . . .

The Nelson Model H

Here's a stud welder—Light in weight, flexible in position, fully automatic in operation are features *only* found in the Nelson Stud Welder. With it welds are made in *less than one-half second.* The stud is put in the chuck end of the unit and placed in contact with the steel plate . . . by pulling the trigger the gun automatically welds.

Here are studs—They're made in several sizes and styles for various uses. The Nelson studs are patented "flux-filled" all-position welding studs. They are available in diameters of ¼" to ½"—in overall lengths of 1" to 8". Insulation of all types may be secured with the patented Nelson Insulation Pin.



Here's a stud weld—The weld is stronger than the stud. Complete fusion of the stud to metal results from a fully shielded arc. The stud is placed in the gun, contacted to the metal, and the operator pulls the trigger. This causes the current to retract the stud establishing an arc from the stud to the plate. Zip! And the gun plunges the stud into a molten pool of metal completing the weld. *There's no hole made to weaken the metal parts!*

How Others Are Using Nelson Studs

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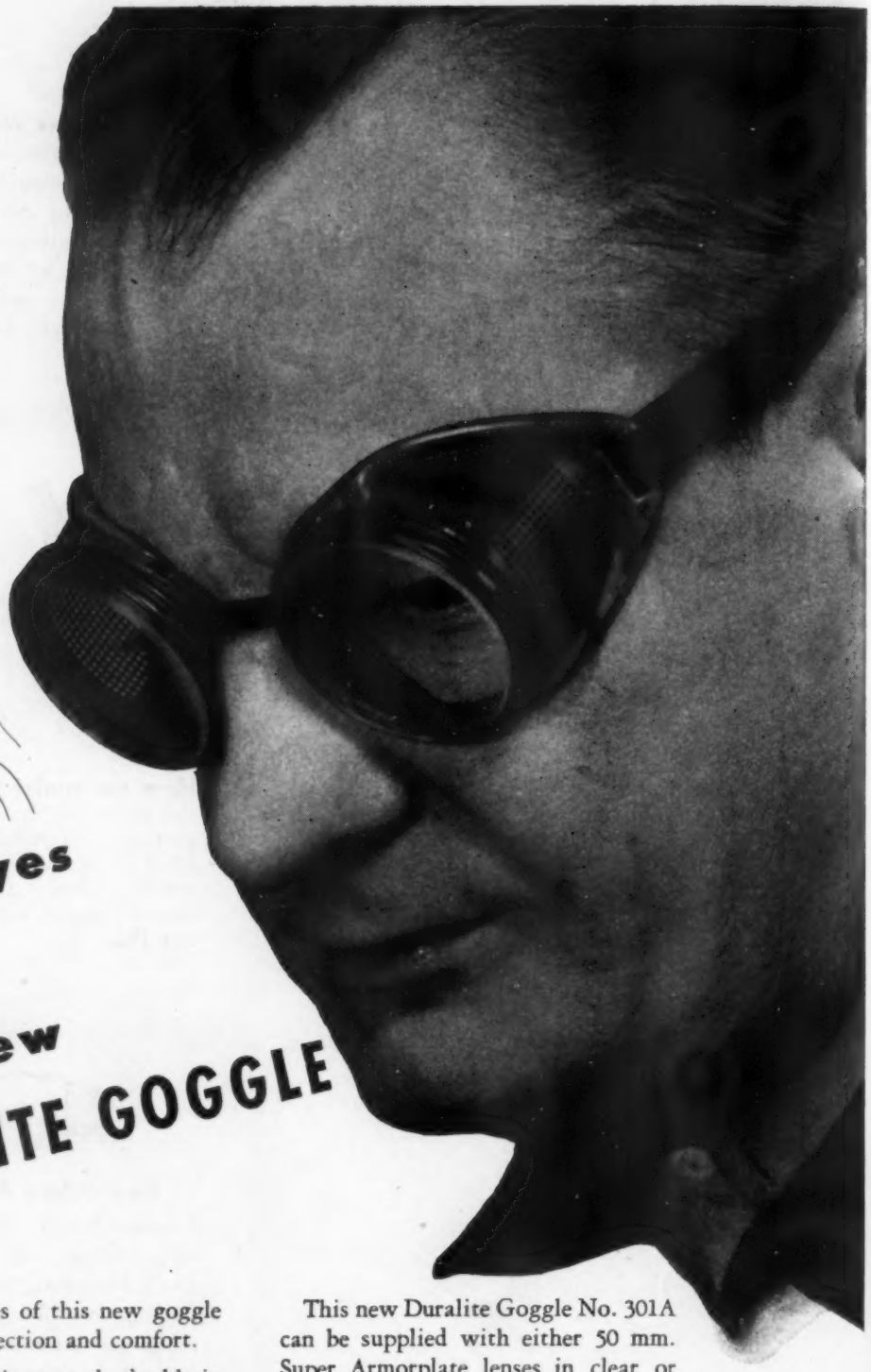
NELSON SPECIALTY WELDING EQUIPMENT CORP.

Dept. A, 440 Peralta Ave., San Leandro, Cal.

Eastern Rep.: Camden Stud Welding Corp., Camden, N. J.

NELSON STUD WELDERS & STUDS



Keep their Eyes On The Job with the New AO DURALITE GOGGLE

Specifically, here are the features of this new goggle that add up to all-around eye protection and comfort.

Larger side shields have perforations nearly double in size and number. This increased ventilation produces a natural draft that keeps lenses clear and eyes cool. Two other AO advantages: new curved nosepiece assures a more comfortable fit; all-elastic headband holds goggles firmly in place.

And the new lightweight acetate eyecups, with smooth, rounded edges, are individually shaped to fit the left and right eye snugly. This closer, more comfortable fit guards against particles striking from all angles, while impact-resisting Super Armorplate lenses protect against direct hits.

This new Duralite Goggle No. 301A can be supplied with either 50 mm. Super Armorplate lenses in clear or Calobar shades. Order from your nearest AO Representative . . . today.

P. S. For the worker who must wear spectacles and needs protection for short periods, the AO Duralite Coverglas Goggle—with the same safety and comfort features as the standard Duralite Goggle—is recommended.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

MANUFACTURERS FOR MORE THAN 111 YEARS OF PRODUCTS TO AID AND PROTECT VISION. BRANCHES IN ALL PRINCIPAL INDUSTRIAL CENTERS

Bellows CONTROLLED-AIR POWER MAKES FEEDING AND HOLDING OPERATIONS *Automatic*

BELLOWS Controlled-Air Devices turn manually operated machines into automatic units, enabling one operator to run two or more machines—doubling, often tripling production.

Bellows Controlled-Air Feeds advance the tool a predetermined distance under a precisely controlled and predetermined power thrust, and then automatically return it to starting position. Used with the Bellows Hydro-check, the rate of feed can be checked at the break-through or at any other pre-determined point. Speed of feed and retraction is subject to infinite variation, can be modified to suit any requirement.

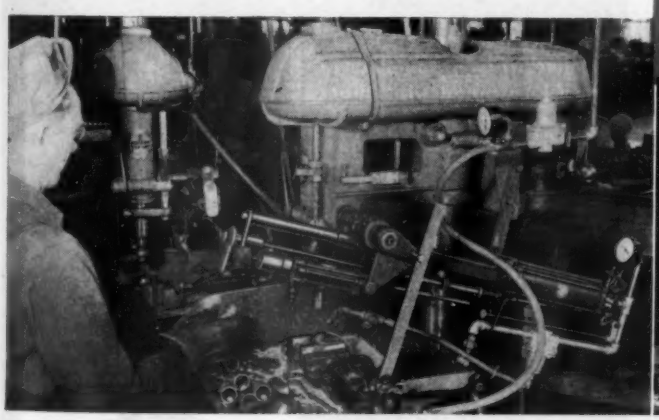
The Bellows Air Vise, a ready-made jig for holding small parts, can be readily synchronized to open and close automatically with the movement of the machine. The exhaust air stream may be used to eject the part as the jaws open and to clean chips from the fixture.

All the operator has to do is to insert the work and push the handle.

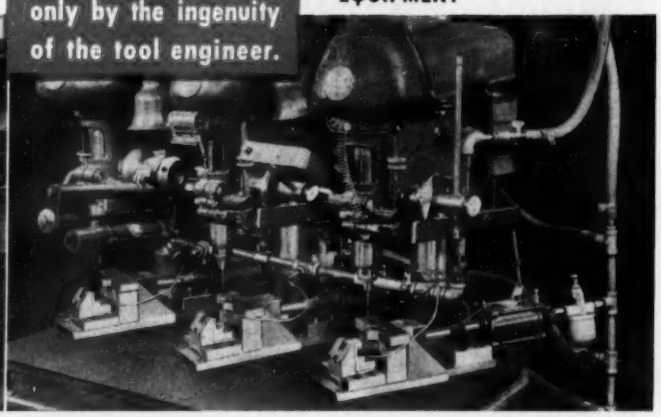
Bellows equipment eliminates the necessity of skilled "feel" on the part of the operator . . . reduces the number of manual operations, lessening operator fatigue . . . permits full utilization of the abilities of new and quickly trained operators.

The use of Bellows Controlled-Air Devices in speeding production, lengthening tool life, lowering worker fatigue, is limited only by the ingenuity of the tool engineer.

WRITE TODAY FOR OUR FREE PHOTO-FACTS FILE SHOWING TYPICAL INSTALLATIONS OF BELLOWS EQUIPMENT



Bellows Drill Press Feed and Air Vises enable one operator to run two drill presses on this fly cutting operation.

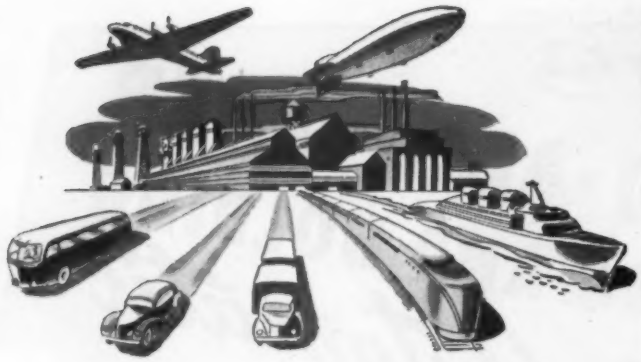


Combination of automatic and manual feed. Holding fixtures operated by cams on star wheel shafts. One girl runs three machines.

The Bellows Co.

ESTABLISHED 1911

AKRON, OHIO



FLUID POWER ENGINEERING *by Parker*

FLUID POWER. Confine fluid in a closed system, apply power at one end, and you deliver power instantly at the other end.

That is Fluid Power—based on hydraulics—the 1944 way to get work done. Any kind of work—hard or easy, brutal or delicate.

You can step Fluid Power up or step it down—to lift a tank or wind a watch. You can make it fit the job. You can flow it around corners and into tight places. You can regulate it, by valves, within precise limits.

TRANSMITTING FLUID POWER. Fluid Power is transmitted through tubes; it needs no shafts, gears, pulleys or belts.

When a system of tubes is used to transmit Fluid Power, it calls for wrinkle-free bends, leak-proof fittings, precise operating valves, flow without obstruction. It gets to be an engineering job.

FLUID POWER ENGINEERING. That's been Parker's business for twenty years—designing Fluid Power tubing systems, engineering them, building valves and fittings, and making fabricating tools. Often we do the fabricating, too.

Today, you'll find Parker-engineered Fluid Power systems in refrigerators and bombers, in chemical plants and locomotives—everywhere in industry.

LOOKING AHEAD. With at least one eye on the future, wouldn't you like to talk this through now with a Parker engineer? No matter what you make, or what kind of machines you operate, you are likely to find some interesting possibilities in the Fluid Power idea. An interesting booklet, giving you more facts about Fluid Power, will be sent on request. Address Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

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APPLIANCE COMPANY
CLEVELAND • LOS ANGELES
FLUID POWER ENGINEERING

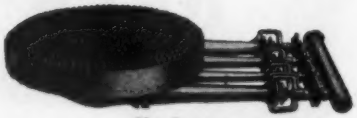
BUZZER *Gas* BURNERS

For Many Industrial Gas Uses

NO BLOWER or POWER NECESSARY
. . . just connect to gas supply

Pipe Burners

Nozzle Burners


Ring Burners

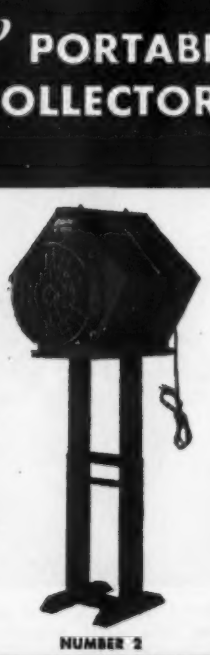
Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

Filtaire **PORTABLE DUST COLLECTORS**

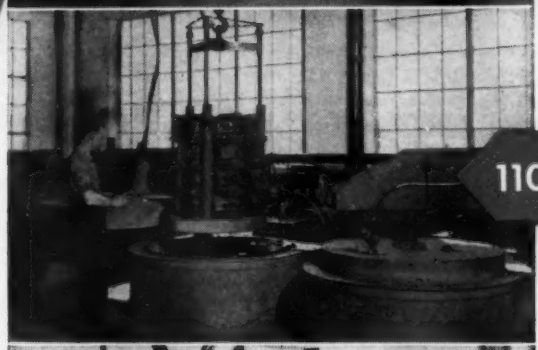
The Filtaire Portable Dust Collector is a completely self-contained unit that will soon pay for itself in dozens of spots in your shop. It stops the damage caused by dust and dirt from grinding and polishing operations. The Filtaire is equipped with replaceable Dustop filters which are inexpensive and absolutely fireproof. Plug the Filtaire into any 110-volt line and it's ready to go. Write for descriptive folder.

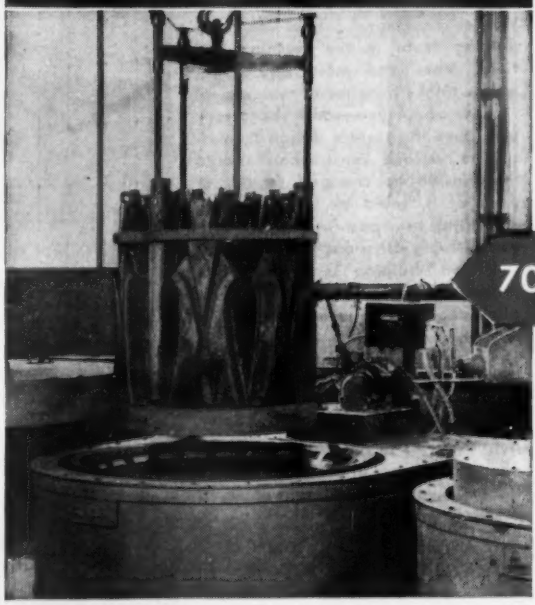

NUMBER 2

EDWARD BLAKE COMPANY
634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.
BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES — WALTHAM CUTTER SHARPENERS

Versatile!

The Lindberg Super-Cyclone Furnace





For all metal treating, utilizing heats from 300° to 1750° F., the Lindberg Super-Cyclone Furnace gives complete versatility.

For instance, in the photographs here, a charge of gear blanks is just going into the Super-Cyclone at 1550° F. Next a load of gate valve weldments is being charged for stress relieving at 1100° F., and below, 16 railroad frogs are lowered into a temperature of 700°F. for tempering. All using the same Super-Cyclone Furnace!

When a load must be reheated at a lower temperature, after quenching, the Super-Cyclone can be accurately brought down to the proper heat while the load is in the quench, saving precious time and rehandling.

The Super-Cyclone operates on a principle of fan driven hot air from an isolated heating chamber racing at high velocity through the most compact load to build up temperature with rapid uniformity. This allows temperatures to be built up or reduced with amazing speed. And there is a complete avoidance of radiant heat that causes distortion.

This revolutionary heating principle saves time and space, keeps work straighter and cuts production costs. Write for complete information to Lindberg Engineering Company, 2445 W. Hubbard St., Chicago 12.

LINDBERG FURNACES

ARMY E NAVY

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

BUILD IT LIGHTER... BUILD IT STRONGER

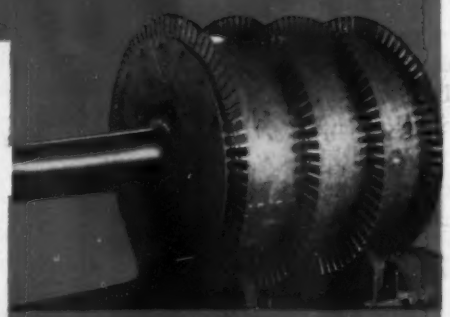
Welded tanks, ships, planes are here. Welded bases and frames are daily gaining favor in the machine tool field. More and more, the paper maker thinks in terms of welding.

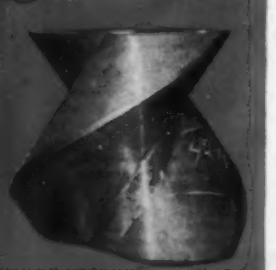
How about you—and your product? Does the current design lend itself to welded construction? Could that design be changed so all, or parts of it, could be welded? How about that new post-war model? Are you welding conscious about it?

United Welding is equipped to fabricate parts out of rolled steels, alloy steels or Everdur—of practically any size or weight—on a long or short run basis. Large annealing ovens and a complete sand blast plant feature United facilities.

Submit drawings now for quotation. Feel free to consult United Engineers on changes in design—to make it lighter, yet stronger—and easier to produce.

THE UNITED WELDING COMPANY
Middletown, Ohio





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WELDING FABRICATORS OF MODERN DESIGNS

Hundreds of Practical Designs and Procedures

A comprehensive digest of design ideas developed for us by one of America's outstanding welding consultants is awaiting your request. It's chock full of ideas. Shows you how to use bars, plates, sheets, angles, channels, beams, pipe, tubing, sheared and flame cut sections to cut costs, get a better design, a stronger product. Better have this digest in your files if you want to meet changing conditions in the post-war period.

Initial Sheets FREE!

Write today, No Obligation!

HOBART BROTHERS CO., Box AM 5-11
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* PROMPT Deliveries on Welders if suitable priority.

HOBART

"One of the World's Largest Builders of Arc Welders"

De Laval No. 194 Coolant Clarifier at Erie Bolt & Nut Co. (left). At right is shown a De Laval Chip Oil Extractor for salvaging cutting oil and chips.

DE LAVAL "Hermetic" Clarifier ends *PRODUCTION DELAY*...

Before installing the De Laval "Hermetic" Coolant Clarifier, the Erie Bolt & Nut Company of Erie, Pa., had been troubled by excessive loss of productive time due to necessary wheel dressings and tool setups. Moreover, the cost of cleaning grinders and sumps was too high.

The De Laval "Hermetic" Coolant Clarifier (which feeds and discharges the liquid under pressure, eliminating foaming) ended both difficulties. Like all De Laval Coolant Clarifiers, this "Hermetic" keeps coolant free from harmful abrasives and metallic sediment. Therefore, coolant can be used continuously without impairment of its effectiveness and wheels retain their fast cutting action much longer.

Whenever De Laval Clarifiers are used the production between wheel dressings is increased and the quality of finishes produced is improved. It is also possible to grind to closer limits and there is less likelihood of distorting the work or of starting fatigue cracks.

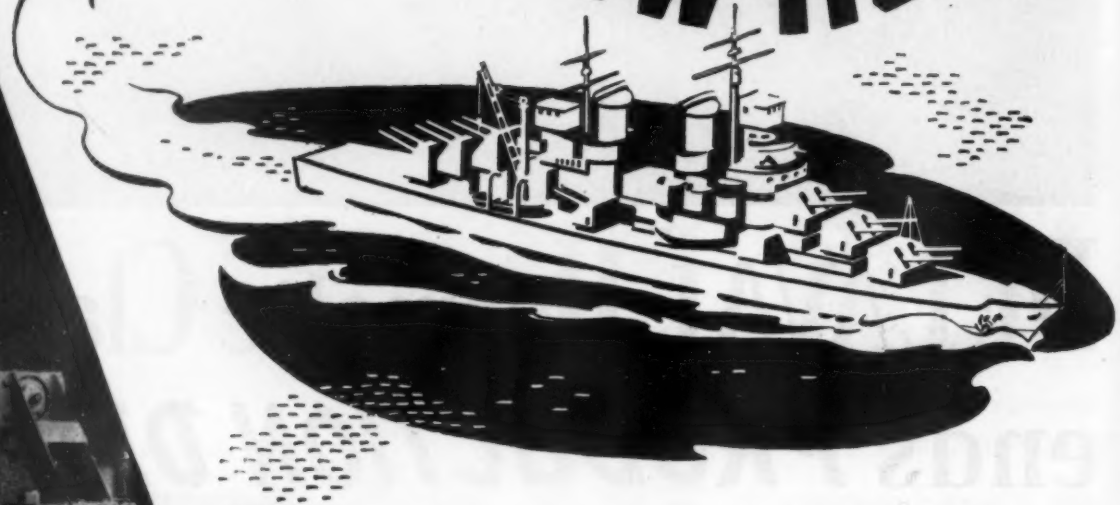
It will pay you to investigate. Write for Bulletin FG-17.

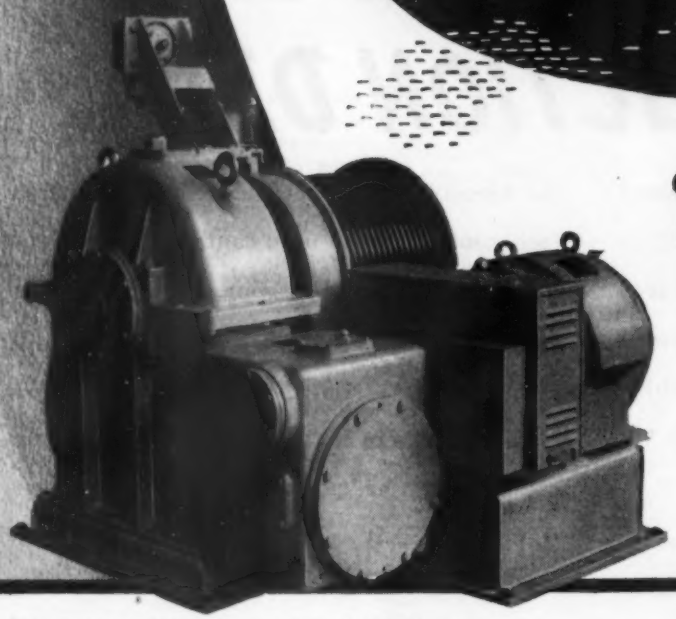
DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 — 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL — PETERBOROUGH — WINNIPEG — VANCOUVER

COOLANT CLARIFIERS ★ ★ OIL PURIFIERS

WE'VE GOT THE "KNOW-HOW"





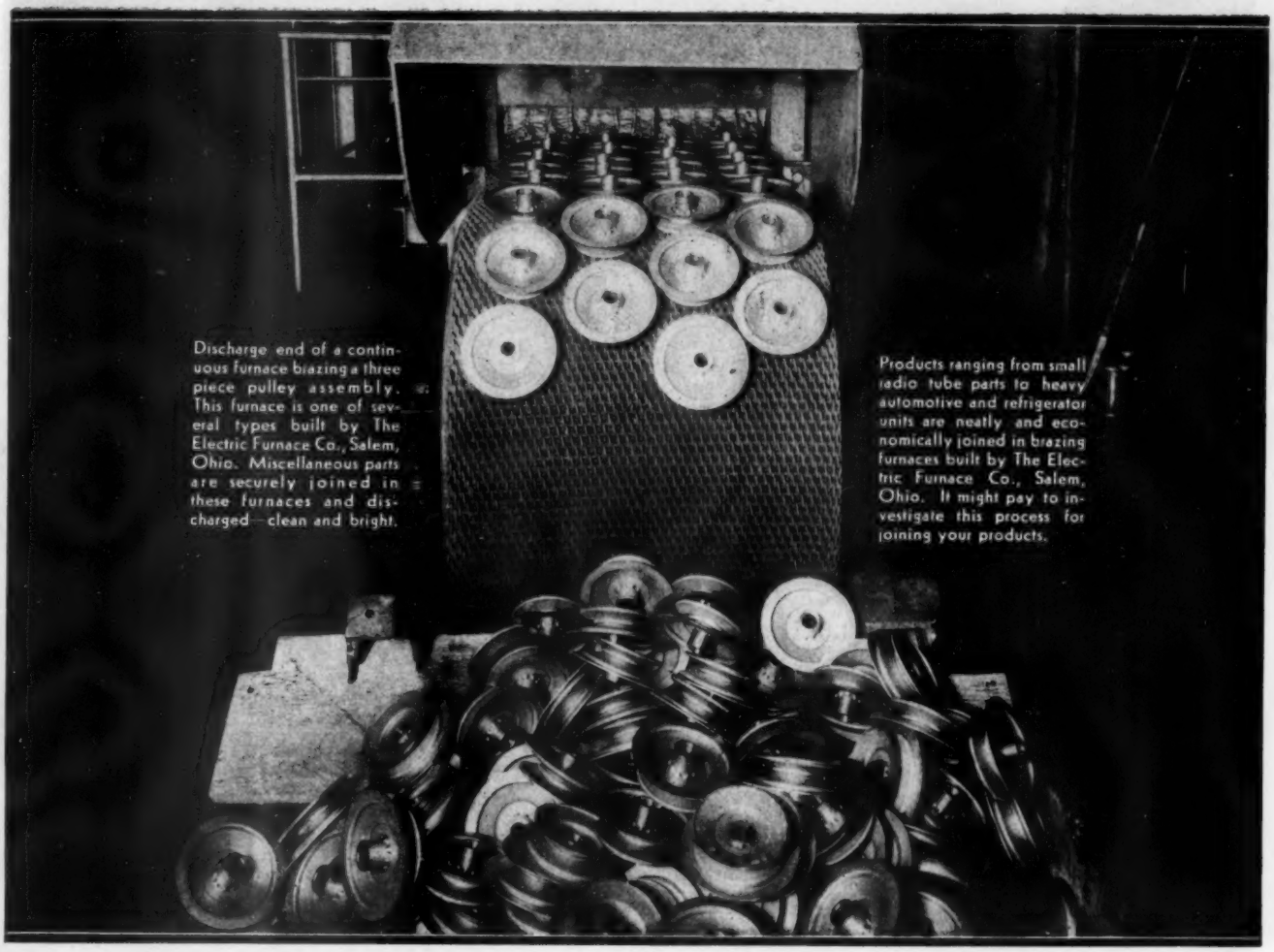
● Working out difficult hoist problems with the U. S. Navy has given Bayard the "know-how" In the post-war world, this knowledge and technique will prove invaluable—for we'll be ready to give you its full benefit.

This hoist is the type used in Boat Cranes on ships of the Atlanta class. It has a two-speed electric motor, automatic electric brake, high ratio reduction gearing in oil-tight, weatherproof case and a drum scored for rope—all 100% anti-friction mounted and built into a self-contained compact unit.

BAYARD

The third star of continued achievement has now been added to the Bayard Navy "E" Pennant.

M. L. BAYARD & CO., INC. • PHILADELPHIA • ENGINEERS • MACHINISTS



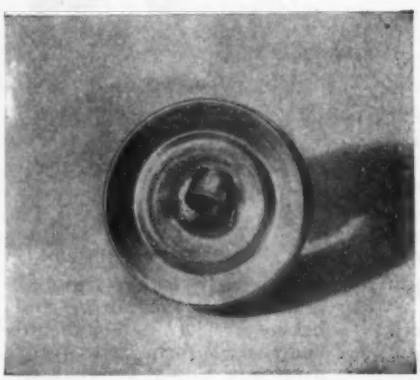
Discharge end of a continuous furnace brazing a three piece pulley assembly. This furnace is one of several types built by The Electric Furnace Co., Salem, Ohio. Miscellaneous parts are securely joined in these furnaces and discharged—clean and bright.

Products ranging from small radio tube parts to heavy automotive and refrigerator units are neatly and economically joined in brazing furnaces built by The Electric Furnace Co., Salem, Ohio. It might pay to investigate this process for joining your products.

The Completed Assemblies are Discharged

Securely Joined, Bright, Continuously

. . . from EF Brazing Furnaces



The above shows the result of a laboratory test on an automobile fan pulley in which the hub was brazed to the web. The complete pulley was placed in a press and pressure applied. The steel web broke but the brazed joint held securely.

"Greatly improved results—neater, stronger joints—60 to 75% faster, at about one-quarter the former labor cost." That briefly is the report received from the production manager of a prominent midwestern plant after installing an EF continuous brazing furnace for joining some of their steel assemblies.

Within a month after installing their first brazing furnace, a second similar but larger furnace was ordered for joining other products—both furnaces are now operating side by side, joining all kinds of assemblies—large and small—neatly, economically and securely.

Products difficult or expensive to make in one piece can be made in several pieces and joined—thus not only reducing the cost but actually improving the quality and appearance. Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly and economically joined right in the production line in your shop.

Strong, leak-proof joints are made and the completed unit is discharged from the furnace—clean and bright.

Any number of joints in the same product or any number of pieces can be joined at one time. The most intricate parts or assemblies are brazed and joints are made which are as strong, or even stronger than the original parts. On some parts it is possible to anneal and braze in one operation.

Investigate this process for joining your Aluminum, Brass, Copper or Steel Parts

With slight changes in design you may be able to join your metal assemblies, neater, cheaper and stronger by this method.

Send for printed matter showing various types of EF brazing furnaces.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

Bottleneck Breakers

By pressing metal powders into the desired shape in one stroke, it has been possible for Chrysler Corporation to produce many parts for weapons in but a fraction of the time required to machine them by ordinary methods. This process also eliminates waste of precious materials and saves countless man-hours.

It all started some years before the war when Chrysler Corporation's Amplex Division began pressing "Oilite" bearings out of powdered metal and impregnating them with oil which penetrated the tiny pores of the metal itself. Once installed in hard-to-reach places in automobiles, vacuum cleaners, washing machines and other devices, these bearings provided their own lubrication without further attention.

Today almost every American-built weapon is made in larger quantity, at a saving of time and material, and functions better in action because it contains from one to scores of precision parts made by Powder Metallurgy. Such parts range from single pieces weighing 64 pounds down to tiny rivets weighing 10,000 to a pound.

Thus the science of peace has been applied to conserving the nation's manpower, materials and finances while speeding the production of better weapons.

You recall how Grandma mixed flour, seasoning and baking powder . . . then shaped and baked them into vastly different kinds of cookies, doughnuts, cakes and bread.

Powder Metallurgy is fundamentally very similar. Starting with metal "flour" so light and fluffy a breath of air would blow it away, various "recipes" are mixed, pressed in molds and actually "baked" in huge heat-treating ovens . . . to become tough, *finished parts* for many types of war equipment.

You'll Enjoy Major Bowes and His Amateurs
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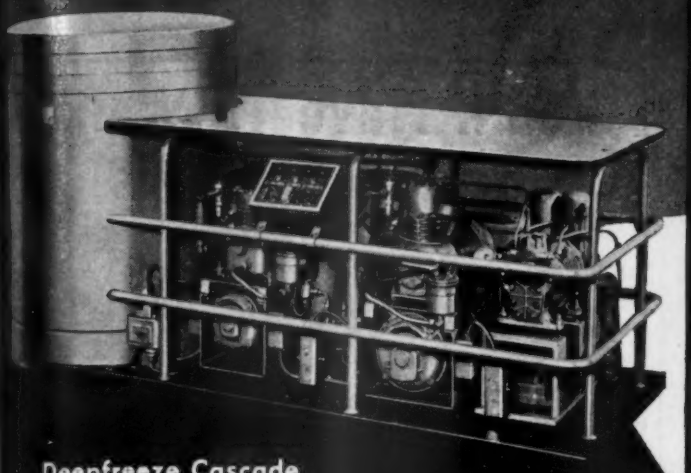
Does This Answer Your Questions About The NEW Deepfreeze Process for Cold Treating Metals?



Deepfreeze Cascade
−120° F. Industrial
Chilling Machine

What Is the Deepfreeze Process?

It is the application of Deepfreeze Industrial Chilling Machines for the hardening, seasoning, shrinking and testing of metals by freezing at temperatures down to −120° F. This process involves a new principle of refrigeration, which permits faster, more efficient heat removal.

What Is the New Deepfreeze Refrigeration Principle?

100% primary freezing surface is provided in the Deepfreeze machine, which has been designed with a double-wall chilling cylinder, through which a refrigerant circulates. It is possible to reach temperatures as low as −120° F. with the Deepfreeze machine, which has the capacity to remove 1,000 B.T.U.'s per hour, at −120° F., when the work is immersed in a convection fluid

How Does the Deepfreeze Process Compare With the Dry Ice Method?

Dry ice temperature of −109° F. delivers a maximum chill of only −91° F. working efficiency, as compared with a constant 24 hour temperature of −120° F. provided by Deepfreeze. The cost for removing 1,000 B.T.U.'s per hour for a 24-hour day, over the period of one year, with dry ice is approximately $3,000; the current consumption of the Deepfreeze machine over the same period of time costs $175.

What Is the Cost of Deepfreeze?

The initial cost of only $2,500 for the standard Cascade −120° F. Industrial Chilling Machine is quickly recovered in reduced production costs. One manufacturer saved from $3,000 to $4,000 per month in shrink-fit application. Gage manufacturers save time and money by seasoning gages to prevent change in finished size. The increased tool life resulting from cold treating reduces down-time and lowers tool cost.

Is the Deepfreeze Process Still in the Experimental Stage?

No! Hundreds of Deepfreeze Industrial Chilling Machines are now being used in actual production. Deepfreeze equipment has been tested and proven highly valuable in such firms as The General Electric Company, Timken-Detroit Axle Company, Dodge Motors, Pratt and Whitney Division, Monsanto Chemical Company, Greenfield Tap and Die Corporation.

How Are Deepfreeze Sub-Zero Temperatures Being Used?

The possibilities for applying Deepfreeze Industrial Chilling Machines in your plant are practically unlimited. Here are but a few of the many applications finding widespread use in industry today.

- Treating of high speed steel cutting tools.
- Shrinking of metal.
- Shrink-fit assembly.
- Stabilization of gages.
- Hardening of precision machine parts.
- Testing of aircraft instruments and materials.
- Testing of lubricants, paints, plastics, chemicals, synthetic rubber and pharmaceuticals.

How Can Sub-Zero Temperatures Be Adapted to My Work?

If, after checking Deepfreeze uses listed above, you are not sure how sub-zero temperatures can be beneficially applied to your manufacturing, let Deepfreeze engineers work with you in finding the solution to your industrial metal chilling problems. The Deepfreeze Industrial representative in your territory will be glad to assist you in handling sample parts for a Deepfreeze test in the factory laboratory. There is no obligation.

What About Delivery?

If you can qualify, under government priority regulations, you can expect prompt delivery on Deepfreeze standard chilling machines.

WHERE CAN I GET MORE INFORMATION?

The complete and latest data on the use of sub-zero temperatures for industrial use can be found in the new Deepfreeze Metal Chilling Data Book. A Deepfreeze representative will be glad to answer other questions you may have and can furnish you with any further information.

Deepfreeze

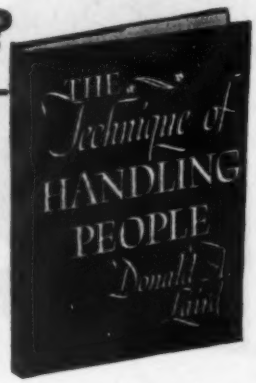
2327 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan

Do people like you *instinctively?*



Do you know how easy it is to exercise the qualities that impress people favorably, that lead them instinctively to give that extra ounce of loyalty, cooperation, and effort to your ideas and orders?

To win the rewards that beckon to leadership today, in all walks of life, you *must work with people*—get them to like you—get over your ideas to them—influence their thoughts and actions. And now a plain method of developing this ability—11 simple rules that successful business leaders follow—things that *you can start doing today, without study or practice*—are given in this new book.

Just Published

THE TECHNIQUE OF HANDLING PEOPLE

By DONALD A. LAIRD *and* ELEANOR C. LAIRD

Price only $1.75

How to understand and work with others

This readable, practical manual presents 11 pointers on what to do and say in your everyday contacts with others, in order to win their friendship, good-will, and cooperation. The methods are clearly demonstrated in numerous stories of real people, outstanding leaders, of today, and together form a direct, easy-to-understand, easy-to-use technique for improving your relations with others and especially for securing better results in training, directing, supervising, and other elements of successful leadership.

Read what—

EUGENE G. GRACE, who became president of Bethlehem Steel at thirty-seven, says about observation;

WALTER S. GIFFORD, who became president of A. T. & T. at forty, says about listening to opinions;

CHARLES E. WILSON, self-made president of General Electric, says about wanting to get ahead;

WALTER D. FULLER, who advanced from selling copies of the *Saturday Evening Post* to presidency of the Curtis Publishing Co., says about Big Ideas to get ahead;

LOUIS RUTHENBURG, who became president of Servel at forty-six, says about the spirit of work.

The observations of these and many other important men of industry lend concrete evidence to back up the soundness of Dr. Laird's book. The book gives seasoned, practical advice on the technique of handling people and shows in quickly understandable fashion how to use the psychology of leadership.

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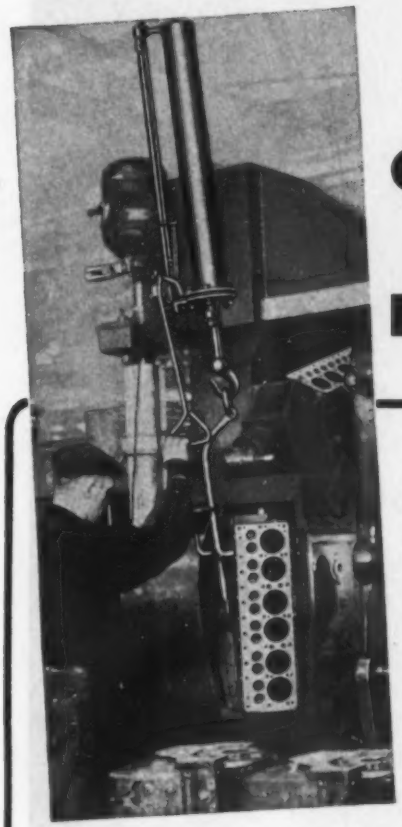

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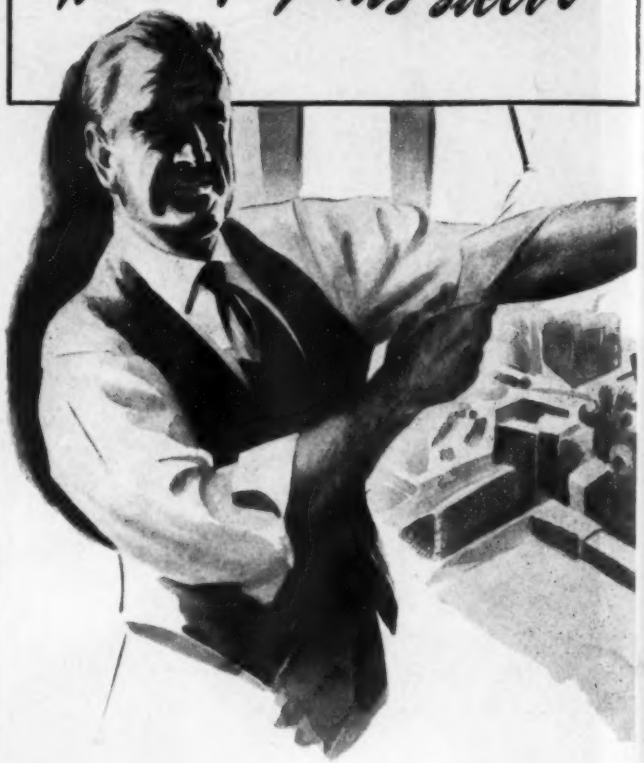

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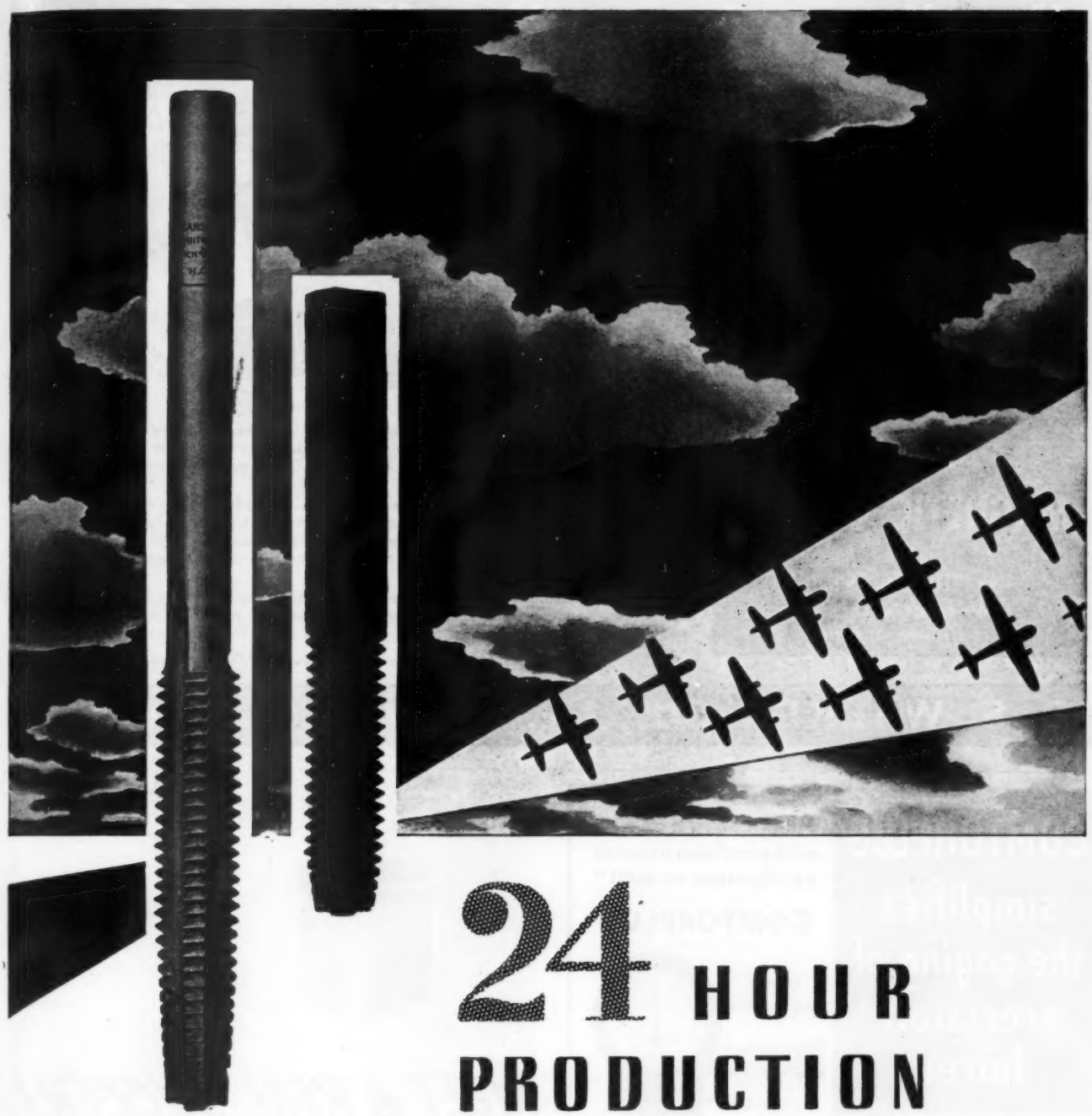

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Simplified gaging, with precision assured to fractions of .0001"

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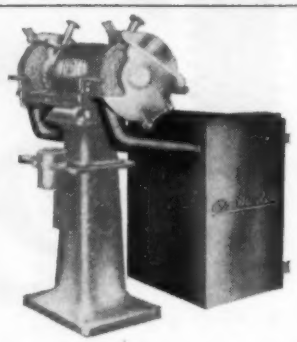

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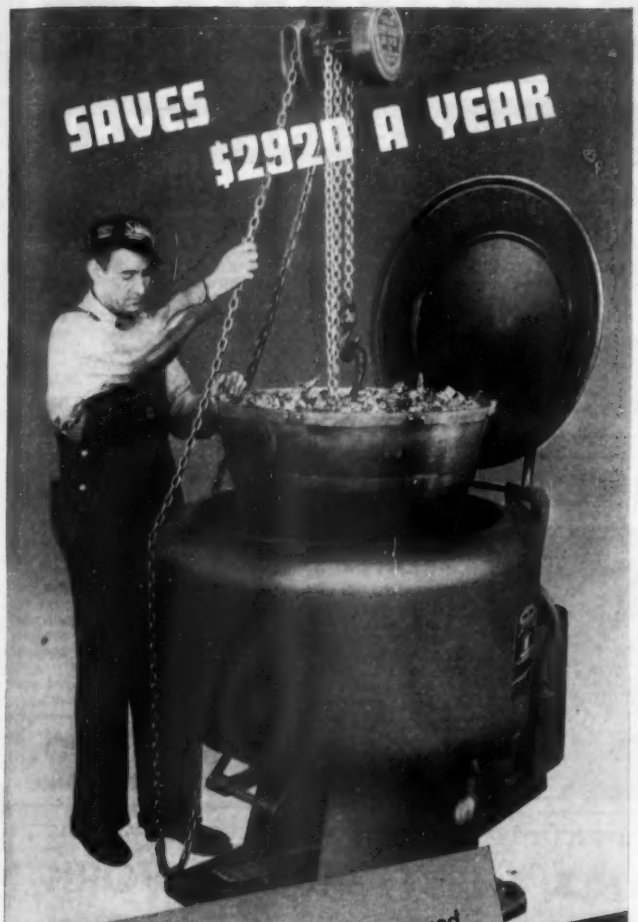

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RESEARCH ENGINEER. Age 30-40. Familiar with manufacturing, organization and sales. Small town in Wisconsin. Give fully, age, experience, references, salary expected. P-832, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

(*Continued on page 338*)

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We want a man to take complete charge of production and personnel, under the direction of the Plant Superintendent, in a plant engaged in producing small complete assemblies of precision-machined parts. Must be familiar with all types of machine tools and qualified to pass on engineering of dies, jigs, and fixtures. Personnel being increased to 200 employees, but a large part of the company's output is assigned to subcontractors. Occupational record should show ability to satisfactorily perform on this job.

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When writing give us the following information: names of last three employers, dates started and dates quit, position held, salary paid, name of supervisor (we will not correspond with past employers if you request), age, draft status, education, and other information you believe would be helpful to us in determining your qualifications. Your traveling expenses will be paid to our plant if we ask for an interview.

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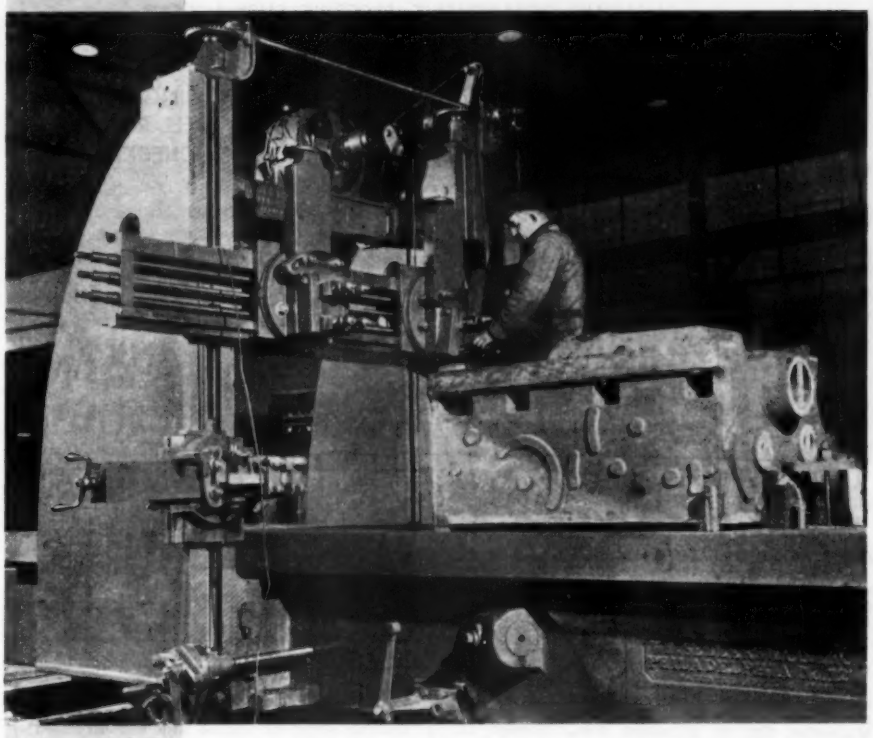
Weapon No. 1
IN A WAR OF METAL*



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Must Comply With W.M.C.

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Tool service man with experience on production use of cutting tools and gages. Carbide tool experience valuable asset. Practical shop man preferred. Good salary and traveling expenses. Permanent future assured. Present brief of your experience. All replies will be contacted.

P-822, AMERICAN MACHINIST
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W-813 AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

(*Continued from page 337*)

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#5 AJAX FORGING ROLLS, M.D. 75 H.P.
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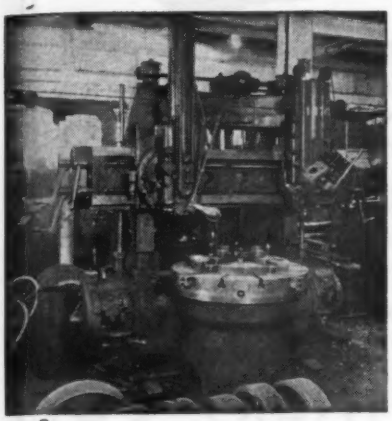

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Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.

PLANERS

120" x 72" x 35' Betts, 4 Heads, M.D.*
72" x 72" x 18' Pond Heavy Pattern, 4 Heads.
48" x 48" x 12' Putnam Heavy, 2 Heads, M.D.
30" x 30" x 12' American M.D., 2 Heads.
30" x 30" x 10' Cincinnati Heavy Pattern, 2 Hds.
26" x 26" x 8' Gray, Belt Dr., 1 Head.
24" x 24" x 6' Cincinnati, Belt Dr., 1 Head.

PLANER - SHAPER

20" x 20" x 36" Niles-Bement-Pond, M.D.

SHAPERS

14" Gould & Eberhardt M.D.
15" Queen City M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
16" Gould & Eberhardt (Old Pattern) Back Geared 4 step cone, with Vise and c/s. Good condition, $600.00.
16" W. P. Davis motor driven B.G.
24" Gould & Eberhardt High Duty M.D.
26" Cincinnati Triple Geared Belt Dr.

GRINDERS

13 Brown & Sharpe Universal and Tool.
12" Persons-Arter Rotary Surface Grinder.
16" Heald Rotary Surface Grinder.
12" Heald Rotary Surface Grinder also equipped with 9" Dia. Permanent Magnetic chuck.
#2 Brown & Sharpe 10" x 30" Univer. Cylindrical Grinder.
14" x 36" Pratt & Whitney Vertical surface Grinder Ball Bearing.
2 Cincinnati Centerless Grinder, Filmatic.
24" x 136" Landis, Univ. Cylindrical Grinder.
12 Greenfield Hydraulic Internal Grinder.

GEAR CUTTERS

612 Fellows 36" Gear Shapers, (2)
24" Schuchart & Schulte.

BRAKE

203 Dries & Krump Apron Type, Motor Dr., 10' x 11 Ga.

AUTOMATIC

Davenport Model "B" High Speed, 5 spindle 9/16" cap. Threading spindle, complete, perfect condition.

LATHES

Mulliner 12" x 5' Toolmakers Lathe with backing off attachment, taper attachment draw Bar and Callets, Chucks. Chip pan and standard equipment.
Lodge & Shipley 20" x 10' 12 speed geared head, M.D.
Rockford 16 x 6 Toolroom Lathe, Taper, Chucks, M.D.
LeBlond 21 x 8 High Duty, Taper, Chuck, M.D.
LeBlond 21" x 16' High Duty, Taper, Chuck, M.D.
Schumaker & Boye 24" x 10' QCG**, Taper, Chuck, Belt Dr.
Putnam 26 x 12 Heavy QCG, arr. for M.D.

Headquarters for Punch Presses

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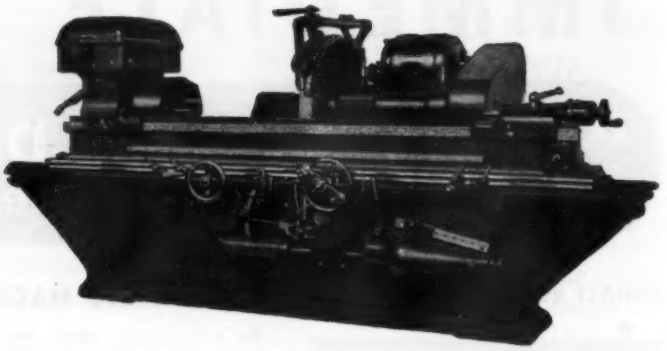
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



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10x36	14x36	16x50
10x50	14x50	18x96
10x72	14x72	18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD — CHICAGO 6, ILL.

SAE 1019

Item No.	
160. . . ¾" rd.	174 lbs.
101. . . 1" Hex.	607 lbs.
102. . . 2½" rd.	1018 lbs.

SAE C-1019

103. . . ¼" x ⅝"	312 lbs.
104. . . 11/16 dia.	104 lbs.
105. . . 1½" dia.	285 lbs.

SAE 1020

106. . . ¾" rd.	680 lbs.
107. . . ¾" x 1¼"	120 los.
108. . . 1" x 1¾"	3418 lbs.
109. . . 1 1/16" rd.	6672 lbs.
110. . . 1 3/16" rd.	4937 lbs.
111. . . 1¼" rd.	1994 lbs.
112. . . 1¾" rd.	1500 lbs.
113. . . 2" rd.	2000 lbs.
114. . . 2½"	2924 lbs.
115. . . 3½"	11400 lbs.
116. . . 3¾" dia.	12350 lbs. (HR)

SAE X-1020

117. . . 2½" dia.	9152 lbs.
118. . . 3¼" dia.	4751 lbs.

SAE 1022

119. . . 1⅜"	479 lbs.

SAE 1025

120. . . 1⅜"	474 lbs.

SAE 1112

121. . . ¾" sq.	388 lbs.
122. . . ¾" rd.	600 lbs.
123. . . ¾" rd.	4520 lbs.
124. . . 1 3/16" dia.	1500 lbs.
125. . . 2¾" dia.	5133 lbs.
126. . . 3¼" dia.	2904 lbs.
126-A. 2½" dia.	734 lbs.

SAE 1113

127. . . 1⅜"	159 lbs.
128. . . 2"	140 lbs.

SAE B-1113

129. . . 1 5/16" dia.	5072 lbs.
130. . . 1¾" dia.	1323 lbs.

SAE A-2315

131. . . ⅝" dia.	47 lbs.

SAE 2330

A132. . . 3/16" CDA	1900 lbs.
133. . . 3/16 HRA	2000 lbs.
134. . . ¼" CDN	2500 lbs.

Item No.	
135. . . ¼" CDHT	154 lbs.
136. . . ¼" CDA	2200 lbs.
137. . . 5/16" Hex. CDN	6322 lbs.
138. . . 5/16" CDN	5449 los.
A139. . . ⅜" CDN	2000 l.s.
A140. . . ⅜" CDA	3133 los.
141. . . 7/16" CDA	6474 lbs.
142. . . 7/16" Hex. CDA	28281 lbs.
143. . . 7/16" Hex. CDN	11225 l.s.
144. . . ½" Hex. CDN	10029 lbs.
145. . . ½" Hex. CDA	4921 lbs.
146. . . 9/16" Hex. CDA	22757 lbs.
147. . . 9/16" Hex. CDN	45000 lbs.
148. . . 9/16" dia. CDHT	704 lbs.
149. . . ⅝" HRA	294 lbs.
150. . . ⅝" dia. CDN	308 lbs.
151. . . 11/16" CDA	5000 lbs.
152. . . 11/16" CDHT	235 lbs.
153. . . ¾" CDN	9850 lbs.
154. . . ¾" rd. HRA	810 lbs.
155. . . ¾" rd. CDHT	85 lbs.
A156. . . 13/16" Hex. HRA	1600 lbs.
A157. . . ⅞" CDHT	9362 lbs.
158. . . ⅞" Hex. CDA	17149 lbs.
159. . . ⅞" Hex. CDN	3842 lbs.
A160. . . 15/16" CDA	136 lbs.
A161. . . 15/16" CDHT	8220 lbs.
A162. . . 1" CD	2000 lbs.
163. . . 1" CDHT	3000 lbs.
164. . . 1" Hex. CDN	152 lbs.
165. . . 1⅛" Hex. CDN	397 los.
A166. . . 1 5/16" CDN	1343 lbs.
A167. . . 1¾" CDHT	5500 lbs.
168. . . 1⅜" CDN Hex.	459 lbs.
169. . . 1 7/16" dia. HRA	10449 lbs.
A170. . . 1 7/16" CDHT	11880 lbs.
171. . . 1½" rd. CDN	202 lbs.
A172. . . 1 9/16" HRA	350 lbs.
173. . . 2" Hex. CDN	1750 lbs.
173-A. 1¼" rd. HRA	124 lbs.
174. . . 4¼" sq. HRA	20000 lbs.

SAE 4130

175. . . 1/16" Hex. CDA	1400 lbs.
176. . . 3/16" dia. HRA	1000 lbs.
A177. . . ¼" x ¾" CDHT	110 los.
A178. . . ¼" CDN	237 los.
A179. . . ¼" x 1" CDA	262 lbs.
180. . . ¼" x 7/16" HRA	195 los.
181. . . ¼" CDHT	637 lbs.
A182. . . 5/16" x 4" HRA	15000 lbs.
183. . . 5/16 HRA	4865 lbs.
184. . . 5/16" CDN	8000 lbs.
185. . . ⅜" x 1" HRA	893 lbs.
186. . . ⅜" sq. CDA	1535 lbs.
187. . . ⅜" HRA	250 lbs.
188. . . ⅜" CDHT	40 lbs.
189. . . ⅜" x 11/16" CDHT	94 lbs.

Item No.	
190. . . ⅜" square HRA	100 lbs.
A191. . . 9/16" x ⅝" HRA	1084 lbs.
192. . . 9/16" CDHT	5283 lbs.
193. . . ⅝" CDHT	13069 lbs.
194. . . ⅝" CDN	23000 lbs.
195. . . ⅝" CDA	651 lbs.
196. . . ⅝" HRA	1848 lbs.
197. . . ⅝" x ¾" HRA	1627 los.
198. . . ⅝" x 3½" HRA	1034 lbs.
199. . . 11/16" Hex. CDN	290 lbs.
A200. . . ¾" x 1½" HRA	4500 lbs.
201. . . ¾" x 2" HRA	440 lbs.
202. . . ¾" Hex. HRA	58 lbs.
203. . . ¾" x 1½" HRA	10235 lbs.
A204. . . 13/16" dia. CD 125,000 psi	12000 lbs.
205. . . 13/16" rd. CDA	2572 lbs.
A206. . . ⅞" x 1½" HRA	14674 lbs.
A207. . . ⅞" x 1 5/16" HRA	1670 lbs.
A208. . . ⅞" x 1 7/16" HRA	10506 lbs.
209. . . ⅞" CDHT	5630 lbs.
210. . . ⅞" rd. HRA	780 lbs.
A211. . . 15/16" CHDT	196 lbs.
212. . . 15/16" HRA	169 lbs.
213. . . 15/16" CDN	3926 lbs.
A214. . . 1" x 1¼" CDHT	322 lbs.
215. . . 1" rd. HRA	20395 lbs.
216. . . 1" x 1¾" HRA	154 lbs.
217. . . 1" sq. HRA	53 lbs.
A218. . . 1 1/16" HRA	1357 lbs.
219. . . 1 1/16" CGN	4000 lbs.
220. . . 1 1/16" x 1¼" HRA	965 lbs.
A221. . . 1¼" x 1¾" HRA	6239 lbs.
A222. . . 1¼" x 1 11/16" HRA	6280 lbs.
224. . . 1¼" x 1 5/16" HRA	805 lbs.
225. . . 1⅜" x 3¾" HRA	69376 lbs.
227. . . 1⅜" CGN	5000 lbs.
228. . . 1 3/16" CDN	9000 lbs.
229. . . 1 3/16" CDHT	5038 lbs.
230. . . 1¼" CGN	4000 lbs.
A231. . . 1 5/16" dia. HRA	6480 lbs.
232. . . 1 5/16" CDA Rd.	1139 lbs.
232-A. 1¼" square HRA	5810 lbs.
A233. . . 1⅜" HRA	1000 lbs.
234. . . 1⅜" CDN	2911 lbs.
235. . . 1⅜" CDA	159 lbs.
236. . . 1⅜" CDHT rd.	589 lbs.
237. . . 1½" rd. HRA	841 lbs.
A238. . . 1 7/16" CDN	12100 lbs.
239. . . 1 7/16" CDHT	3202 lbs.
240. . . 1⅝" x 1¾" HRA	3744 lbs.
241. . . 1 9/16" HRA	107 lbs.
242. . . 1¼" sq. HRA	210 lbs.
243. . . 1¼" CGN	2506 lbs.
244. . . 2" CDA	1927 lbs.
245. . . 2¼" rd. HRA	150 lbs.
246. . . 2¼" CDHT	1167 lbs.
247. . . 2¼" CDN	128 lbs.

Item No.	
A248. . . 2½" RCS HRA	21900 lbs.
A249. . . 3¼" HRA	749 lbs.
A250. . . 3½" sq. RCS HRA	1470 lbs.
A251. . . 4" HRA	139002 lbs.

SAE 4140

252. . . 3/16" dia. HRA	4700 lbs.
253. . . ¼" CDN	224 lbs.
254. . . ¼" dia. CDN	5716 lbs.
255. . . ½" Hex. CDN	478 lbs.
256. . . ½" rd. HRA	375 lbs.
257. . . 5/16" CDN	697 lbs.
258. . . 7/16" CDHT	18 lbs.
259. . . ⅝" dia. CDN	12700 lbs.
260. . . ⅝" rd. CDHT	143 lbs.
261. . . 9/16" rd. HRA	127 lbs.
262. . . ⅝" x 2¾" HRA	17969 lbs.
A263. . . ⅞" dia. CDN	6000 lbs.
264. . . ⅞" x 4¾" HRA	79 lbs.
265. . . ⅞" rd. HRA	116 lbs.
A266. . . 13/16" dia. CD 125,000 psi	5000 lbs.
267. . . 13/16" CDHT	3536 lbs.
A268. . . 13/16" x 1¼" HRA	11565 lbs.
A269. . . 15/16" dia. CDN	4000 lbs.
270. . . 15/16" rd. HRA	119 lbs.
A271. . . 1" x 1¼" HRA	31111 lbs.
A272. . . 1" x 1¾" HRA	3432 lbs.
273. . . 1" dia. CDN	44000 lbs.
274. . . 1" rd. HRA	2282 lbs.
275. . . 1 1/16" rd. HRA	73 lbs.
A276. . . 1¼" x 2½" HRA	6980 lbs.
277. . . 1¼" x 1 5/16" HRA	600 lbs.
278. . . 1¼" rd. HRA	168 lbs.
279. . . 1 3/16" dia. CDHT	2097 lbs.
280. . . 1 3/16" dia. HRA	5290 lbs.
A281. . . 1 3/16" dia. CDN	15000 lbs.
282. . . 1 3/16" CDN	2000 lbs.
283. . . 1¼" x 3¼" HRA	1376 lbs.
284. . . 1¼" round CDHT	167 lbs.
285. . . 1 5/16" CDN	8000 lbs.
A286. . . 1 11/16" dia. HRA	115000 lbs.
A287. . . 1 11/16" dia. CDA	121568 lbs.
288. . . 1 11/16" rd. CDA	13763 lbs.
289. . . 2" x 2¾" HRA	973 lbs.
A290. . . 2¼" dia. HRA	38337 lbs.
A291. . . 2½" dia. CDA	7300 lbs.
A292. . . 2½" x 4" HRA	119 lbs.
293. . . 2¾" x 3" HRA	900 lbs.
A294. . . 2¾" x 7¼" HRA	146 lbs.
295. . . 3" sq. HRA	11441 lbs.
296. . . 3½" rd. HRA	325 lbs.
297. . . 3½" x 5½" HRA	158 lbs.
298. . . 4" rd. HRA	5477 lbs.
299. . . 5" x 6" HRA	194 lbs.
A300. . . 6" sq. HRA	5652 lbs.
A301. . . ¾" x 1½" CDA	7800 lbs.
A302. . . ¾" x 1½" HRA	8625 lbs.
303. . . 1 25/32" x 6 9/16" HRA	48375 lbs

For immediate shipment from New York stock.

NORTHEASTERN STEEL COMPANY 352 GROVE STREET BROOKLYN 27, N. Y.

IMMEDIATE DELIVERY
PRACTICALLY NEW AND REBUILT

BORING MILLS

1—54" Cincinnati Hypro Vertical, M.D. (Used 3 months)

1—42" Bullard New Era, M.D.

1—36" Bullard Rapid Production, M.D.

1—24" Bullard Rapid Production, M.D.

RADIAL DRILLS

2—3A Carlton Radial Drills 5' 17" Col. (Used few months)

1—6' Cincinnati Bickford, M.D.

MILLERS

2—#4 Cincinnati Horiz. Dial Type, M.D.

2—#3 Cincinnati Vert. Dial Type, M.D.

1—#3 LeBlond Plain, M.D.

1—#3B Milwaukee Plain, M.D.

1—#4 Cincinnati Hi Power Vertical, M.D.

1—#6 Becker Vertical, M.D.

1—#5B Becker Vertical, M.D.

2—#3 Cincinnati Dial Type Vertical, M.D.

1—#3 Hendey Norton Plain, M.D.

2—#3H Milwaukee Vertical, M.D.

1—#2B Milwaukee Plain, M.D.

1—#2 Van Norman Plain, M.D.

1—#2 Brown & Sharpe Vertical, M.D.

2—#6 Whitney Hand, M.D.

1—#4 Cincinnati High Power, M.D.

1—#4 Cincinnati MD 3 step, double back gear, M.D.

1—#2B Milwaukee, Double Overarm Universal, M.D.

1—#2B Milwaukee Double Overarm, Plain, M.D.

1—#2A Brown & Sharpe Univ. Vert. Attach. & Divid. Head

1—#2B Brown & Sharpe Plain

1—#2 Cincinnati Universal, M.D.

1—#25 Bilton Plain, M.D., Back Geared, Power Feed

1—#2 Davenport Plain, M.D., Power Feed

1—#13 Garvin Power Feed

1—#1 Cincinnati Universal M.D. Divid. Head

1—#25 Becker Back Geared Power Feed

1—#26 Becker Power Feed

1—#2 Fox Miller, M.D.

2—Kempsmith Millers, Power Feed

3—#7H Beckers

2—#7 Beckers

1—#3 Garvin Duplex, Table 12" x 64"

5—U.S. Hand Mills

2—#6 Whitney Hand Mills

1—#0 Van Norman Tool Room Mill, Power Feed to Table

MILLERS (Continued)

1—4" Bar Rockford Horizontal Boring Mill, Single Pulley Drive

3—3" Niles Horiz. Boring Mills

1—1½ Universal Cincinnati Back Geared Power Feeds

LATHES

2—27" x 48" American Engine, M.D.

1—36" x 20' American Engine, M.D.G.H.

1—27" x 16' Lodge & Shipley Engine, M.D.

1—25" x 18' LeBlond Engine, M.D.

1—24" x 16' Lodge & Shipley, M.D.

1—27" x 18' LeBlond Engine

1—24" x 12' American G. H Engine

2—22" x 72" LeBlond Heavy Duty Engine

3—24" x 72" LeBlond Heavy Duty Engine

4—20" x 12' Fay & Scott, Q.C. Engine

1—20" x 72" LeBlond Rapid Production, M.D.

1—20" x 10' LeBlond Rapid Production, M.D.

1—14" x 30" Hendey Engine

1—14" x 6' American Engine

1—14" x 6' Monarch

1—36" x 16' Putnam Triple Geared Face Plate Drive, M.D.

1—18" x 8' Walcott Quick Change Double Back Geared

1—18" x 8' Hendey Quick Change Yoke Head, Taper Att.

1—18" x 8' LeBlond Quick Change Double Back Geared, H.D.

1—14" x 5' Hendey Q.C. Tool Room

1—14" x 6' Flather

1—14" x 6' Reed

1—18" x 8' Reed

1—13" x 6' Carroll Jamieson Semi-Quick Taper Tool Room

1—10" x 4' Mann Bench Screw Cutting

1—9" x 4' Rockford

1—11" x 4' Seneca Falls

1—12" x 5' Worcester, M.D.

1—16" x 6' Reed-Prentice Double Back Geared Q.C. Tool Room

1—14" x 6' Star Lathe, Turret Attachment

1—16" x 6' South Bend Taper Attachment

1—8" x 12" Sundstrand Geared Head Turning

1—14" x 6' Hendey Geared Head, Taper & Relieving Attach.

1—16" x 32" x 6' Rahn & Larmon, G.H. M.D.

SHAPERS

1—28" Gould & Eberhardt, M.D.

1—20" Kelly Back Geared, M.D.

1—20" Ohio, M.D.

1—18" Rockford, M.D.

1—16" Juengst, M.D.

1—12" Smith & Mills, M.D.

TURRET LATHES

2—#4 Warner & Swasey Bar Feed, M.D.

1—1A Warner & Swasey Universal, M.D.

1—#6 Warner & Swasey Power Feed to carriage, bar feed, M.D.

2—3A Warner & Swasey Universal Bar Feed, M.D.

2—2A Warner & Swasey Universal, M.D.

1—¾" Acme Bar Feed, M.D.

1—1" Foster, M.D.

1—1" Foster Friction Head, B.G. M.D., Bar Feed

1—½" Pratt & Whitney Bench Turret, M.D.

1—1½" Bardons & Oliver, Bar Feed, M.D.

1—1½" Southworth Bar Feed Friction Head, Back Geared

2—1½" Hollow Hexagon Saddle Type Bar Feed Warner & Swasey

1—3" x 36" Jones & Lamson Geared Head, fully equipped

1—4½" Libby Turret Geared Head, Universal, Power Rapid Traverse

1—#6 Warner & Swasey Back Geared Friction Head

1—#4 Warner & Swasey Universal, M.D., in base

1—1B Foster Universal 2" Collet, Bar Feed, Geared Head

1—⅛ Pratt & Whitney, Back Geared Friction Head Turret

PLANERS

1—Putnam 48" x 48" x 18' M.D. 2 Heads on Rail

1—Cleveland 48" x 48" x 14' M.D. Box Table, 3 Heads

AUTOMATICS

#0, #00, #00G Brown & Sharpe, M.D. and plain

⅞" Model G Gridley, 1¾" Model F, 2¼"

1⅝" 6 Spindle New Britain, M.D.

GRINDERS

1—#16 Blanchard Belted, Vertical Surface, M.D.

1—12" x 36" Diamond Horizontal Surface

2—#70 Heald Internal

1—12" x 36" Diamond Horizontal

1—12" x 24" Diamond Horizontal

1—10" x 18" Landis Cylindrical, M.D.

1—6" x 24" Norton Self-contained Cylindrical

1—16" x 60" Modern Cylindrical Self Contained

3—#103 Rivett Internal

S. & S. MACHINERY CO.

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66" NILES-BEMENT-POND Boring and Turning Mills, M.D.

4½" Bar No. 33 LUCAS Horizontal Boring Milling and Drilling Machine, M.D.

#0 FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.

4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.

33" x 9" GOULD & EBERHARDT Spur Gear Cutter

3' WESTERN Plain Radial Drill

7' AMERICAN Universal Radial Drill, M.D.

18/27" Gap Bed Lathes, M.D.

42" PUTNAM Double End Car Wheel Lathe, M.D.

#3-B MILWAUKEE Plain Miller

#2 CLEVELAND Plain Miller

#10 NILES Vertical Milling Machines

#6 BECKER Vertical Milling Machine

30"x30"x10' NEWTON Slab Miller

12" Wm. SELLERS Slotters

20" SELLERS Crank Slotter, M.D.

12"x12" ACME Power Hack Saw, M.D.

48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.

48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.

24"x24"x6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.

42"x48"x12' SIMMONS Openside Planer, 230 volt D.C.

4"x4" capacity ALLIGATOR Shear, Low Knife, M.D. 24" Blade.

#1 L&A Multiple Punch, 100 Tons, 72" between housings

6"x6⅝" SOUTHWARK Double Angle Shear

SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller

60" Throat, 8" x 1 1/16 LONG & ALSTATTER Shear

54" Throat 1¾"x1½" HILLES & JONES Punch

42" Throat, 1¾"x1" HILLES & JONES Punch, M.D.

4" LANDIS Pipe Threading Machine

6" BIGNALL - KEELER Duplex Pipe Machine

10" STANDARD Pipe Threading Machine

4" BAKER Heavy Duty Automatic Tapping Machine

#0 BAKER Keyseater, M.D.

SIMMONS ENGINEERED Machine Tool REBUILDING

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EASTERN OFFERS FROM STOCK

IMMEDIATE SHIPMENT —NO PRIORITY

MANUFACTURING TYPE MILLING MACHINES

No. 3-24 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., latest
No. 4-36 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d., with tracer control, latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d., latest
4½x12" Pratt & Whitney Thread, m.d.
6x14" Pratt & Whitney Thread, belt
6x48" Pratt & Whitney Thread, m.d.
6x80" Pratt & Whitney Thread, m.d.
28" Cincinnati Plain Automatic, belt
36"x36"x14' Bement Slab, m.d., p.r.t.
54"x54"x10' Liberty Planer Type, m.d.
No. 2 Pratt & Whitney Lincoln Type, belt
No. 12 Pratt & Whitney Lincoln Type, belt
Becker Lincoln Type, belt
Burr Mfg., belt
Carter & Hakes Mfg., belt
Newton Keyseat, m.d.

INTERNAL GRINDERS

No. 12A3 Heald Sizematic, 3 m.d.
No. 6 Bryant, belt
No. 10 Bryant, belt
No. 20 Bryant, belt

SURFACE GRINDERS

No. 1 Fraser Lapper, belt
14" Pratt & Whitney Vertical, m.d.
38"x38"x12' Gray Planer Type, m.d.
54" Bridgeport Knife, belt

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d.
No. 55 Heald, m.d.
No. 60 Heald, belt
No. 65 Heald, m.d.

HAMMERS

400 lb. Bliss Board Drop
600 lb. Niles-Bement-Pond Steam
800 lb. Bement Single Frame Steam
1100 lb. Bement Single Frame Steam

MANUFACTURING LATHES

3½x36" LoSwing, s.p.d.
3x80" LoSwing, m.d.
8x84" LoSwing, m.d.
9x12" Sundstrand Mfg., s.p.d.
No. 9 Heavy LeBlond Multi-Cut, m.d.
11"x4' Wells Speed Lathe
15"x6' Automatic Threading Lathe, m.d.
20"x18" centers LeBlond Rapid Production, m.d.
20"x72" centers LeBlond Rapid Production, m.d.
20"x9' American Geared Head Turret, m.d.
20"x16' American Geared Head Spindle Boring Lathe
NEW Niles-Bement-Pond Quartering Machine, m.d.
NEW No. 5 Niles-Bement-Pond Center Driving Car Wheel Lathe, m.d.
Used No. 5 Niles-Bement-Pond Center Driving Car Wheel Lathe, m.d.
Niles-Bement-Pond Axle Lathe, cone

MILLING MACHINES—HORIZONTAL

No. 3 Kent-Owens Hand, m.d., with power l.f.
No. 2 Cincinnati Plain H.P., m.d.
No. 2 Heavy Plain Kearney & Trecker, m.d. in base, Timken Bearings
No. 3 Brown & Sharpe Plain, cone
No. 3B Brown & Sharpe Plain Double Overarm, m.d. in base, Timken equipped
No. 3B Milwaukee Plain Double Overarm, m.d.
No. 4 Cincinnati H.P. Plain, rect. overarm
No. 4 Cincinnati H.P. Plain, round overarm
No. 4B Milwaukee Plain Double Overarm, m.d.
No. 5B Heavy Brown & Sharpe Plain, m.d.
No. 5 Cincinnati H.P. Plain, rect. overarm, m.d.
No. 5 Cincinnati H.P. Plain, rect. overarm, m.d., extra large table
No. 3 Cincinnati H.P. Universal, m.d.

MILLING MACHINES—VERTICAL

No. 1 Knight, cone
No. 2 Knight, m.d.
No. 2 Kempsmith Maxi-Miller, m.d. Timken Bearing
No. 3 Cincinnati, m.d.
No. 4 Knight, m.d.
No. 5 Jackson, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d.
No. 28-60 Cincinnati Vertical Hydrotel, m.d., latest type, practically new

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BULLARD 24" R.P. Vert. Turret Lathe
N.B.P. 96"x90"x15' Planer; 4 heads; DC variable M.D.; box table
N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive
GRAY 24"x24"x6' Single Head Planer
GRAY 72"x48"x12' Planer — two heads; belt drive
HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive
LUCAS 3" bar Horiz. Boring Mill; M.D.
D. & H. 3½" Bar Horiz. Boring Mill
TAYLOR & FENN 6" Spline Miller; M.D.
CINCINNATI #2 Vert. Miller, M.D.
LEES BRADNER #6 Thread Miller
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LANDIS 20"x220" Plain Grinder;
LANDIS #3½ Int. Hydraulic Race Grinder
DIAMOND #4 Surface Grinder; Hyd. Feeds
HEALD #60 Internal Grinder; M.D.
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ESPEN LUCAS No. 138 Cold Saw — Cap. 12"
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
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No. 1 LANDIS; Bath UNIV.
INTERNAL: No. 72 HEALD SIZEMATIC.
No. 52 GREENFIELD HYDROILS (2)
No. 70 HEALD; No. 60 HEALD.
CENTERLESS: MODEL M-1 ZEPHYRS (2)
SURFACE: No. 16A BLANCHARD, M.D.
No. 16 BLANCHARD, M.D.; 15" x 15" x 96" NORTON.
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26" & 18" LIBBEYS; 7½" & 3½" holes in sp. Bar Feed.
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21" GISHOLTS, 3½" & 5" holes in sp.
28" NILES BEMENT POND, Gd. Hd.

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No. 652 NEW BRITAIN CHUCKER.
Nos. 2 & 3 MANVILLE WOOD SCREW MACHINES.

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No. 5 CINCINNATI, Rect. Overarm.
No. 4 CINCINNATI, Cone Drive.
No. 4 LEBLOND HEAVY DUTY.
No. 3 CINCINNATI, S.P.D.
No. 3 VAN NORMAN DUPLEX.
UNIVERSAL: No. 1½ HENDEY NORTON.
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No. 2½-B K & T; No. 6 BECKER.
THREAD MILLS: 6" x 48", 6" x 72" P&W.
No. 3 LEES BRADNER.
PLANER TYPE & SLAB: 44" x 40" x 10' INGERSOLL. 42" x 13' INGERSOLL SLAB; 42" x 36" x 6' B&S.
PRODUCTION: 10" x 24" x 15' K&T SIMPLEX M.D.; OHIO TYPE P, M.D., Table 16" x 72", New 1941; 24" & 18" CINCINNATI AUTO., M.D.; 2" P&W DUPLEX SPLINE MILL.

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6" GIDDINGS LEWIS, Table type, New 1942.
8" NBP, Floor type, M.D. with Motor.
No. 43 LUCAS, 5" bar; M.D. (2).
5" DETRICK HARVEY, M.D., No. 6 M.T.
3½" No. 32 G&L, M.D.; No. 3 LUCAS.
3⅞" No. O G & L; 4" KEMPSMITH.
2½" NEWARK; 3½" BEAMAN SMITH.

VERTICAL BORING MILLS

10 FT. POND, 8" dia. table, M.D.
72" & 60" COLBURNS; 48" COLBURN.
53" NBP 51" BULLARD;
6" & 8" BULLARD MULT-AU-MATICS, M.D.

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26" x 8' BRIDGEFORD; 30" x 12' LEBLOND;
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30' PIT, Face plate 156".

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BETTS SLOTTER, 9" stroke.

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6 FT. DRESES; 3 FT. AMERICAN M.D. (2)
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3' AMERICAN, M.D.
4' AMERICAN.

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No. 25 FOOTE BURT; No. 263 BARNES 26".
No. 242 BARNES 25"; 25" SNYDER.
36" PRENTICE; 22" WEIGEL.
2 SPINDLE FOOTE BURT Heavy Duty
8 SPINDLE MULTIPLE, M.D. No. 5 M.T.

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60" x 60" x 18' WOODWARD POWELL.
60" x 60" x 18' NILES, 2 heads, M.D.
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44" x 36" x 12' GRAY, 2 heads on rail.
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36 FT. SELLERS PLATE PLANER.
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NILES 12" Vert. Slotter
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BLANCHARD 26" Vert. Surf. Grinder
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48"x36"x16' Gray Dbl. Housing Planer, 3hds., 15 HP, A.C. m.d.

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12"x18" Cinci. Plunge Cut Grinder, A.C. m.d., 20x8" face wheel, rebuilt.

3¼" bar Morris Horiz. Boring Mill, m.d. with 4 bars.

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Norton 6x32, 10x24, 18x96
Baxter D. Whitney #23 Cylinder Grinder, Like New
Brown & Sharpe #10, 11 Plain
Brown & Sharpe #1, 2, 3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Bryant #16 Hole; Bryant #3B, 6, 12 Internal
Brown & Sharpe #2 Surface
Blanchard #16—26" Chuck, M.D.
P & W 14" S.B. Vert. Surface
Farrel Roll Grinder
LATHES:—Lodge & Shipley 20"x8' Selective G.H.
Johnson 30"x24'
Le Swing 4"x60", 3½"x108"
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MILLERS:—Cin. #3, 4 Plain SPD
Milw. #1½B Double Overarm Plain
Cincinnati #2 Plain, Cone Drive
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Milwaukee #1½B Vertical
Becker #4B Vertical
Cin. #4 Vertical SPD
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P&W 5" Automatic
Pratt & Whitney 12" Heavy Auto.
Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12", 6"x48" Thread Millers
Cincinnati 12" B.G. Mfg.
Becker #7H Lincoln
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Cincinnati 30"x30"x10'
Cincinnati 36"x36"x20'
Gray 36"x36"10' 2 Head Planer; Gray 42x42x12
PRESSES:—Z & H #16 Percussion
Ferracute #DGGF56 Double Geared 105 Ton Cap. 36" stroke, Weight 36000 lbs. New 1939

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Pratt & Whitney 14" x 36" Vertical Spindle Ball Bearing Grinder, Model B, Serial #945, motor drive including motor and 11" x 34" magnetic chuck. Excellent condition.

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18" Gleason Bevel Gear Generators.
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Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cone.
#3 Adams Farwell Gear Hobber.
#2 Pfauter Gear Hobber.
#18H Gould & Eberhardt Gear Hobber.

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42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drive.
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.

RADIAL DRILLS

2½' American Plain, M.D.
3' American Sensitive.
3' Cincinnati Bickford Plain Radial Drill.
4 Spindle Sipp, Power Feeds.

LATHES

18" x 8' Lodge & Shipley, 3 S.C.D. D.B.G.
22" x 10' LeBlond 3 S.C.D. Q.C.
26" x 15' Pittsburgh, 3 S.C.D. Q.C.
20" x 8' Sebastian Geared Head, S.P.D.
36" x 18' Schumacher & Boye 5 S.C.D. Trip. Grd.

MISCELLANEOUS

14" Niles Slotter.
#4 Cincinnati Vert. High Power Mill, M.D.
#2B Brown & Sharpe Plain Miller, S.P.D.
#2 Cincinnati H.P. Universal Miller, S.P.D.

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

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BORING MILLS

VERTICAL

36", 120 Niles
42" Bullard, 1 turret head
54", 62" Colburn, M.D.
36" Bullard V. T. L., side head

HORIZONTAL

2½" Universal, Binsee
4" Binsee
4½" Bement-Niles

TURRET LATHES

26" Libby, 7½" hole
18" Libby, 3½" hole
24" Disholt, 6½" hole
W. & S. No. 2A, M.D., 3" cap.
Foster No. 1B, M.D.
Foster No. 4, 5, 6
W. & S. No. 2, 4, 6
Gisholt Automatic, M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd. head

GRINDERS

P. & W. 14", 18", B. B. Vert., M.D.
Blanchard 26", 30", M.D.
Norton Crankpin 16x50"
Landis 20x72"
Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald No. 55, 72A, Internal, M.D.
Norton 50"x28', M.D.
Gardner 72", Disc, M.D.

LATHES

48"x12' Harrington Gap Sld. Bed.
McCabe 26-42"x14'
26"x24' Putnam 3 step cone, D.B.G.
24"x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & Shipley Grd. hd, taper, M.D.
14"x6' Hendey, tie bar, taper
14"x6' Mulliner, taper

AUTOMATICS

Cleveland Model A, ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Gridley 1¼", 2¼" 4 spindle
Cleveland ⅞" Model M, 4 spindle
Gridley 4¼", single spindle, M.D.
B. & S. #00 OG, 2G
P. & J. No. 6A, M.D.
New Britain 1⅝" six spindle

SHAPERS

14" P. & W., M.D.
20" Stockbridge, G. & E., S.P.D.
26" Stockbridge, M.D

GEAR CUTTERS

B. & S. No. 3-26", 4-36"
Gleason 11" Bevel

MILLERS

Providence, Planer Type 32"x8'
No. 2, 3, 4, B. & S., and Cincinnati Plain & Univ.
Becker No. 3, AB, 5, 6 Vert.
No. 3, 4 Cincinnati, Vert.

RADIALS

8' American Triple Purpose, M.D.
4' American Triple Purpose, M.D.
5' Dreses, Full Universal
4' Mueller, M.D.
4', 5' Western, S.P.D.

MISCELLANEOUS

Pels 6', throat punch
P. & W. 6" Vert. Shaper
Marvel Metal Band Saw, M.D.
McCabe ½" Flanger
Pipe Machines, 2", 4", 6", 8", M.D.
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Morey 8" Vertical Shaper used less than 100 hours, guaranteed equal to new, with rotary table, forced feed lubrication, power rapid traverse, direct motor drive with 220/440 volt, A.C. Motor.

Milwaukee #3B Plain Miller, double overarm, all gear feeds, direct motor drive, table 15x55".

Cincinnati #4 High Power Plain Miller, all geared feeds, direct motor drive, table 64½x14¼".

Brown & Sharpe #3 Plain Miller, all geared feeds, direct motor drive, table 63x18".

Reed Prentice 6' Heavy Duty Ball Bearing Radial, direct motor drive thru gear box.

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AUTOMATICS, Cleveland, 1¼, 1½, 2¾ & 3¾"
AUTOMATICS, Cleveland, ⅞, 1¼ & 2½" Mod. B
AUTOMATICS, Cleveland, 1¼ & 1½" Model M
AUTOMATICS, Cleveland, 3½" Model K4
AUTOMATICS, Cone 1¼ & 1½" 4 spdles, M.D.
AUTOMATICS, New Britain #22 M.D.
AUTOMATICS, Potter & Johnston #5a & 6A
DRILLS, Baker Heavy Duty, #5 M.T.
GEAR HOBBERS, #5A Lees Bradner, M.D.
GEAR HOBBERS, #3 and 12 Barber-Colman
GEAR SHAPERS, #7 High Speed, M.D. & #61
GRINDER, Blanchard #16 A.R. 5, 30" x 18" Magnetic Chuck, M.D.
GRINDER, Brown & Sharpe #10 & 12 M.D.
GRINDERS, Landis, 6" x 18" Plain M.D.
MILLING MACHINES, Becker Vertical, Model S. D. 40" Rotary Table
MILLING MACHINES, Becker Vertical #3 & 5.

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Bolt Cutter 1" capacity 3 spindle
Brake Robinson 5' toggle
Compressor, 120 Schramm, portable
Drill, near 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
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Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, #1 Morse taper
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Grinder, Sellers Tool
Grinder, 60" knife
Hammer, 30# Bradley upright, helve
Lathe, 24" x 18' Steptoe-McFarlan
Lathe, 18" x 10' Bradford, loose change
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Press, #8-7 Zah-Hahnemann straight side grd.
Press, #1 open back inclinable, motor drive
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Turret Lathe, L & D brass, cross slide turret
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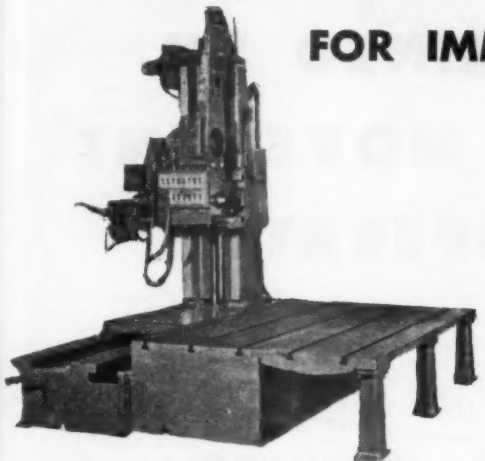

No. BG-724 Keller Automatic Profiler for Die Sinking, Milling and Profiling

Die capacity — face 88" x 48" depth with standard table 30" depth with extension table 58"
Head vertical travel 48"; horizontal travel 72"
Spindle head travel 18"
Maximum reach of spindle 24"
Center distance between cutter and spindle tracer max. 50½"; min. 35½".
Working surface standard table 88" x 30"
Working surface extension table 88" x 58"
Equipped with panel board and switch boxes
Vertical feed drive motor—¾ HP. 110 volts, vary RPM, Ohio D.C.
Cutter spindle motor—2 HP. 115 volts, Gen. Elec. D.C. motor
Column drive motor—⅝ HP. intermittent duty, 115 volts, G.E. D.C.
Horizontal traverse motor—⅛ HP. 115 volts, Ohio D.C.
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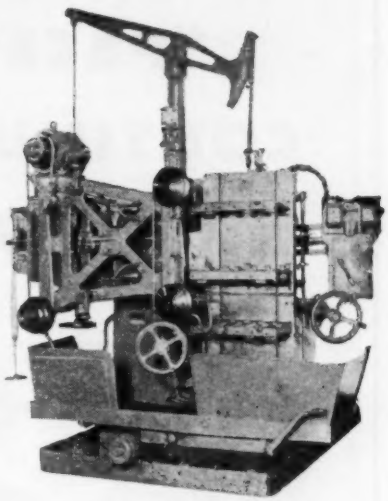

No. E-6 Keller Die Sinker

Die capacity 20" x 27" face x 12" high
Work table 20" x 50"
Cross slide travel 24"—.002" to .040" feed
Table speeds 4" to 24" per mniute
Distance between 24"
Spindle speeds 620 to 3600 RPM.
Complete with motors, coolant system and splash guards
Weight approx. 6850#

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9' Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
No. 0 Fellows Gear Shaper
Cimatool Gear Chamfering, M.D.
Lees-Bradner Gear Grinder

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6" x 6¾" Goss & DeLeeuw Chucking Machine
3" x 36" Jones & Lamson Turret Lathe, Steel Head
1¾" Gridley Model F 4-Spdl. Auto., M.D.

SHAPERS — PLANERS

36"..x 36" x 8' Woodward & Powell Planer, Rev. M.D.
36" x 48" x 12' Cin. Hypro Planer, 4 Hds.
18" x 18" x 4' Whitcomb Planer

MILLING MACHINES

4¼ x 12" Pratt & Whitney Thread Miller
#25B Defiance Hor. Bor. Mill—1941 Model
#2 Brown & Sharpe Plain
#2 Cincinnati Plain

GRINDERS

10" x 120 Norton Grinder, M.D.
#10 Brown & Sharpe Pl. Grinder, M.D.
No. 3 Oesterlein Cutter & Tool Grinder

MISCELLANEOUS

21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Spru Cutter
New Delta Drilling Equipment

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Air Compressor, 245' Ingersoll Rand
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Automatic, 14" Fay
Automatic, 4½" Gridley "H" 4 spdl. chucking
Automatic, 7" Baird 6 spdl. chucking
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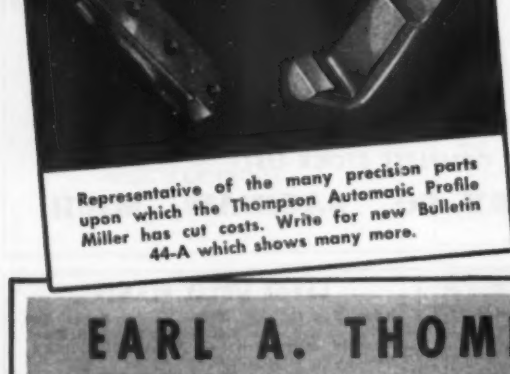

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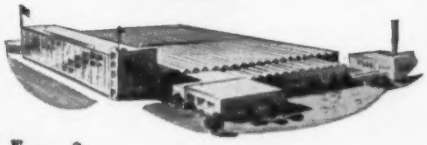

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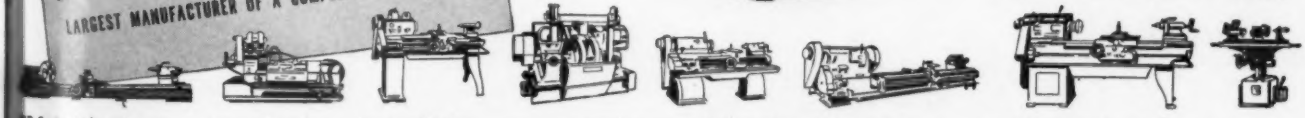

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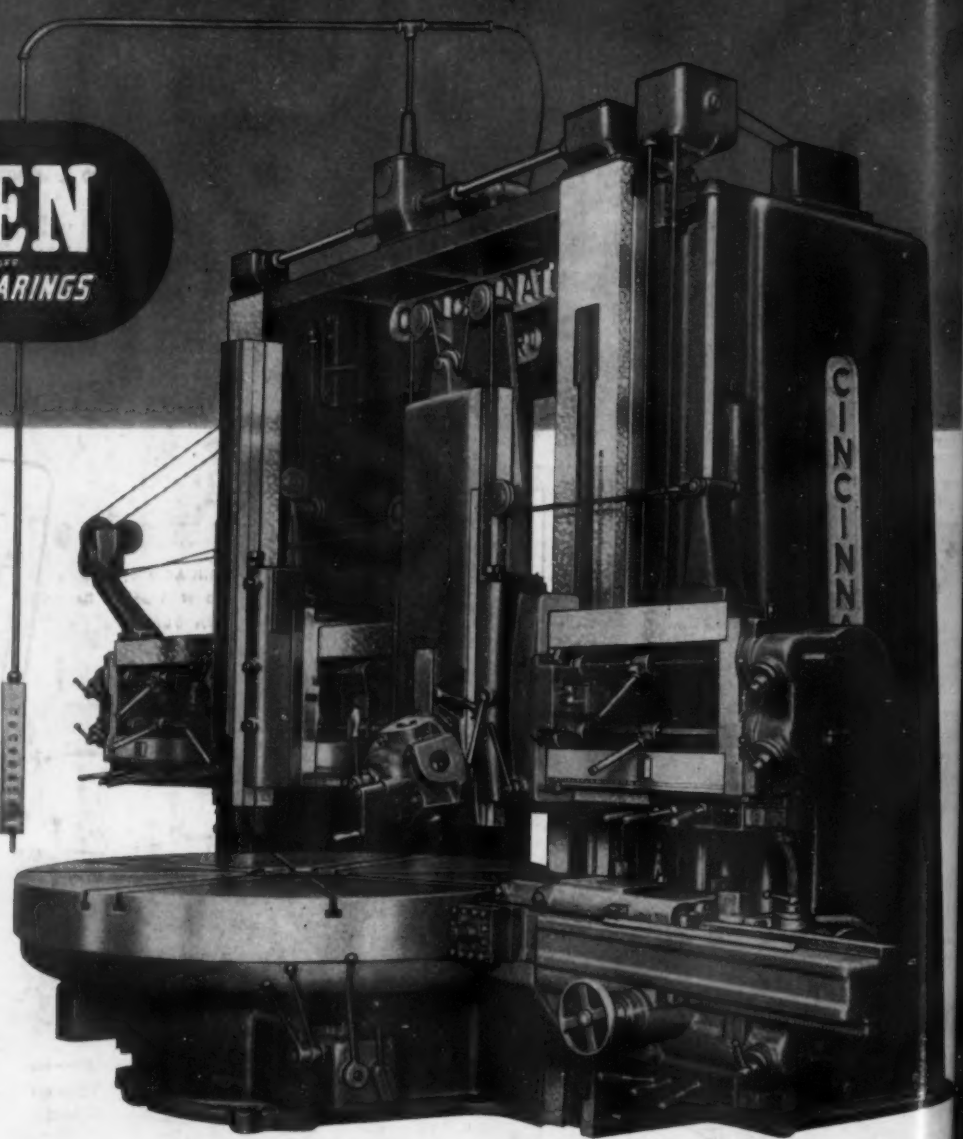
TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



7 foot Cincinnati Hypro Vertical Boring Mill equipped with Timken Bearings throughout the table mounting transmission and feed boxes. Made by The Cincinnati Planer Co., Cincinnati.